The Dock & Harbour Authority

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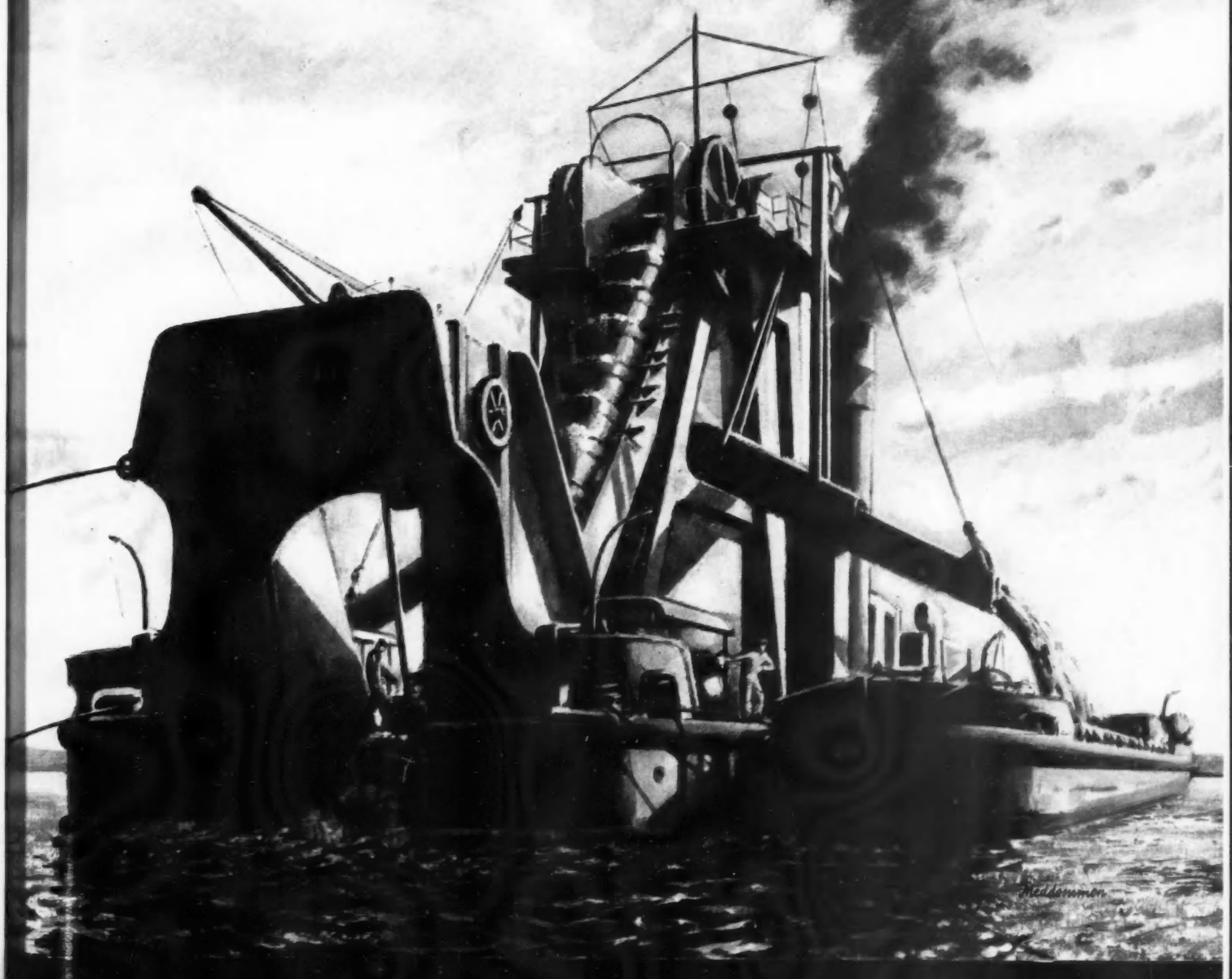

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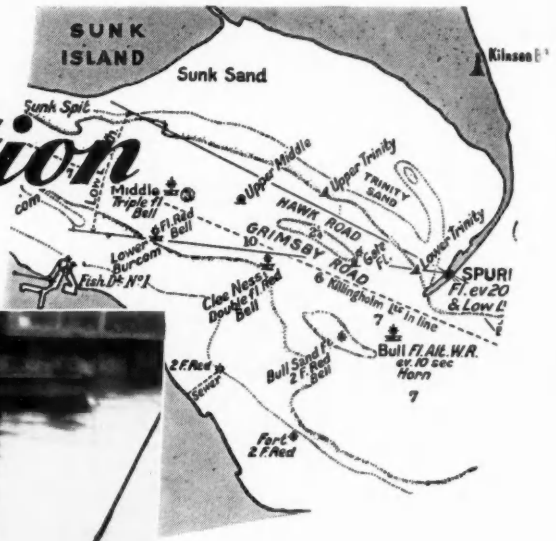

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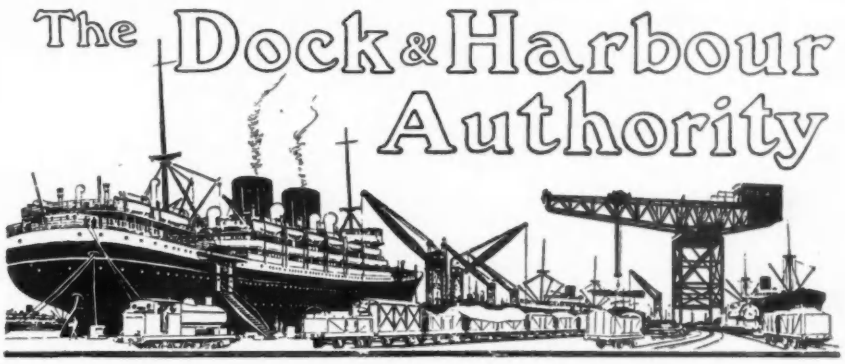

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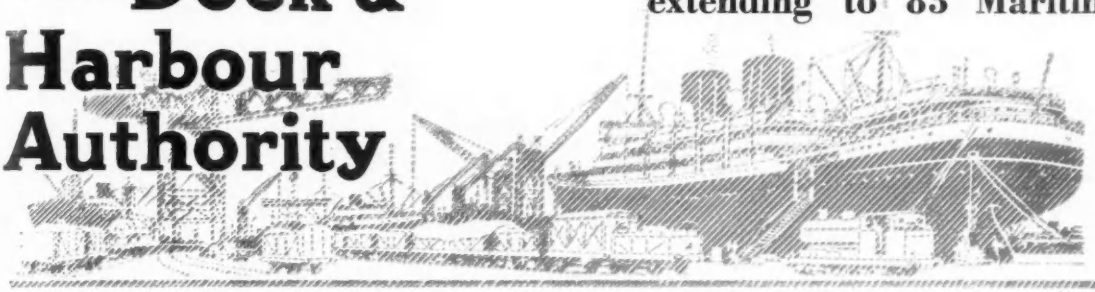

No. 417

Vol. XXXVI.

JULY, 1955

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Editorial Comments

The British Transport Commission.

The seventh Annual Report of the British Transport Commission for the year 1954 has just been published and on a later page the features of particular interest to readers of this Journal are reviewed. As was expected, the Commission's operations during 1954 were carried out at a loss, that is to say without nett receipts from traffic and other sources being sufficient to meet in full interest and central charges. Furthermore, upheaval in rail and road transport is likely to cause an even greater deficit in 1955. The railway undertaking of the Commission overshadows the Docks and Inland Waterways undertakings to such an extent that it is difficult to assess the efficiency with which these latter are operated; nevertheless the report in connection with these is worthy of attention.

No development of outstanding interest has arisen during the year in the Docks division but nett receipts are slightly better than those of the previous year. As to Inland Waterways, which continue to be operated at a substantial loss before any contribution is made towards central charges, interest naturally centres upon the points so recently drawn to the attention of the public by the report of the Board of Survey which was issued recently and was reviewed in detail in our issue for May last. The results during 1954 emphasise many of the conclusions reached by the Board, and especially the need to concentrate on those waterways with considerable future traffic potential.

An article giving some details of improvement schemes shortly to be undertaken by the Commission will also be found elsewhere in this issue. These improvements are exclusively concerned with waterways which at present carry considerable traffic, such as the Trent Navigation and the Aire and Calder Navigation. We are not altogether happy about the proportion of the capital that is ear-marked for depôts and workshops alongside these waterways, and would have thought that some of the money might have been better spent on improvement in the channels and locks and less upon bankside amenities. It is, of course, reasonable to select initially waterways with proven profit-earning capacity for further expansion and investment; also, it would equally obviously be folly to invest further money on waterways which, regrettably, have so far decayed that they are beyond repair and which have little real traffic potential. But between these two extremes there are several water routes which evidently could carry much more traffic than is at present possible due to limited capacity. If the Commission and the Inland Waterways Management is seriously adopting a militant and forward looking policy, it must courageously embark on improvement schemes for certain waterways linking major industrial areas with ports to enable estuarial craft of economic size to operate efficiently over them.

In the meantime the authorities must doggedly persist in their efforts to free the Commission of obligation to maintain those many miles of waterway upon which there is no prospect of extensive traffic nor any hope of earning a profit without a direct subsidy. Proposals to abandon for navigation certain canals have recently caused some public outcry, and it is to be hoped that the energy being expended in this outcry can be directed towards obtaining sanction to transfer those waterways to other authorities more suited to take responsibility for them, with the object of keeping them as pleasances in the public interest.

Meanwhile as a small instalment in the national programme for transport improvement there are the recently completed Holme improvements on the River Trent described on page 76 in this issue. As mentioned in the British Transport Commission Report (see page 99) these works, although primarily directed towards flood prevention, will facilitate traffic to and from Nottingham. This must, however, be regarded only as a small instalment, which has been obtained at a very moderate cost to the Commission. It has been suggested in some quarters that if greater enterprise had been shown in this area at an earlier date, traffic during the past few years would have been considerably higher. Further navigation improvements are still very necessary both on the main route between Nottingham and the Humber, and also for traffic to points inland of Nottingham.

Suez Canal Improvements.

It is seldom in this age of rapid change that a work of engineering completed over eighty years ago can survive until the present day without major modifications, or indeed without being scrapped and rebuilt. The Suez Canal is a remarkable case of the former, and has been subjected to no less than seven major programmes of improvement since its inception.

It is difficult to believe that even the genius of Ferdinand de Lessups could have foretold the number and size of ships that were one day to make daily use of his brainchild. In 1869 the Canal was opened to ships of not more than 5,000 tons, whose transit took 24 hours (an average speed of 4 knots). Today ships of seven times that tonnage pass through from Suez to Port Said and vice versa at nearly double the speed.

Recent rapid increases in the number of ships using the Canal, and especially large tankers loaded with crude oil from the Middle East, have again confronted the Canal Company with a near crisis in respect of the Canal's capacity, despite the completion in recent months of the Seventh programme of Improvements which was begun in 1949. Not only has the Canal become barely deep enough to carry its largest customers, it has become too narrow to accommodate them without either severe erosion of the banks, or a reduction of speed which would cause unacceptable congestion or the deployment of more power than is available in the engine rooms of the largest tankers.

There appears on another page an article in which is described the work done in completion of the Seventh Programme, the experimental work which has become necessary in order to cater for future requirements, and an outline of the proposed works of the Eighth Programme. These last are of considerable magnitude, and it is interesting to note that they are being undertaken at a time when the Concession has but fourteen years to run before the ownership of the Canal reverts to Egypt.

Editorial Comments—continued

Discipline and the Dock Worker.

It was emphasised in the editorial columns of this Journal in November and December last that much of the unrest in the port industry arose because of the ineffectiveness of the disciplinary machinery of the National Dock Labour scheme. On page 81 of this issue is printed a review of "The Dock Worker," published for the Department of Social Science of the University of Liverpool. Although this book deals with conditions of employment and industrial relations in only one port, namely, Manchester, and although the evidence on which it is based was collected over four years ago, it is nevertheless a useful contribution to the examination of the labour problems at present affecting the port industry in this country.

The authors rightly point out that the first task in any enquiry is to identify clearly and precisely the problems which have to be solved and it is soon made clear that the dock industry is different from many others in that it is composed in the main of highly individual characters among employers and men, who like the life because of its element of freedom as compared with factory life and who, by the nature of the work, must work as individuals in co-operation. They also refer to the many major physical improvements in working conditions in the docks and ask why it is that, despite all these, industrial relations are so bad.

The recent official strike of members of the National Associated Stevedores and Dockers does not at first glance appear to be connected with the operation of the National scheme. Closer examination, however, suggests otherwise and the view is still held that the biggest factor in the whole problem of dock labour is that of discipline.

It is possible to over-simplify the reasons why the recent strike occurred. Ostensibly, the main cause was that the newly-formed branches of the Stevedores' Union were unable to obtain representation on the joint negotiating, conciliation and other committees in the ports concerned—Liverpool, Birkenhead, Manchester and Hull. This, in turn, was due to the fact that the Transport and General Workers Union claimed that the new Stevedores' branches were formed of members "poached" from their union and to "poach" is to act in contravention of the T.U.C. agreement known as the "Bridlington Agreement."

There is no reasonable doubt that the Stevedores' Union did build up their new branches in the northern ports by deliberately recruiting members from the Transport Union and it is probably also a fact that those members of the executive committee of the Stevedores Union who favoured this course of action believed that once it was a fait accompli, other interests would have to adjust themselves accordingly. The Stevedores' Union did, however, refute the charge of poaching. What had happened, they said, was that members of the Transport Union who came to them did so voluntarily and only because they were dissatisfied with their own leaders and officials. Since in many cases this was most likely true, it will be useful to try to establish what kind of dissatisfaction this really was.

It would probably be the opinion of the majority of port operators that in most cases union officials do their best to get their rank and file members to honour agreements made with employers. It is said in some quarters that the Transport Union officials are better able to do this because they are appointed and not elected. In the Stevedores' Union, officials are elected for a period of three years only, after which, if they wish to continue in office, they must stand for re-election. This system, it is claimed, is democratic but, as in political spheres, it can mean that an official wishing to retain his job must more and more do what his members want as the period of his office passes.

In both the unions concerned, there are, of course, extreme elements. In recent months these particular men have been gaining support for a policy of "walk out for what you want" and fighting this tendency is even more embarrassing for elected officials than it is for permanent ones. It is, unfortunately, true to say that this policy has been paying the men dividends. Excessive demands, backed by stoppage of work until they are conceded, have been met, particularly by shipping companies whose vessels would otherwise suffer costly delays. Union officials have attempted to combat this technique, but when action of the type described has succeeded once, their task is exceedingly difficult. The dissatisfaction expressed by dockers in the northern ports was at least partly due to this reason. The Transport Union officials usually could not support the extremists' demands.

It is often said that the port industry is different, because in it one abides by the decision of the minority. Be that as it may, it is certainly true to say that much of the trouble arises because the industry has to retain the unwanted services of a small number of men of the kind mentioned. Prior to decasualisation these men would have been eliminated from the industry as their tendencies became known, by the simple expedient of never employing them. Now, once they are registered port workers, they are with the industry for better or for worse. Present methods make it too easy for a man to become a docker and too difficult to dismiss him.

Until this problem is resolved, strikes, official and unofficial, local and national, will be much more likely to occur. There is first class negotiating machinery in the dock industry. It has taken years to build up and it is equal to if not better than that in other major industries. Even from the rank and file point of view, there is therefore no need for the militant agitator.

Need for a Further Enquiry.

In our editorial of December 1954, referred to above, it was stated that trouble is likely to continue to occur frequently at the docks until improvement in the operation of the National Dock Labour scheme has been effected. In support of this view it is pertinent to quote from the 1954 Annual Report of the National Dock Labour Board. Paragraph 9 states "It is relevant to state that employers in London reported 85,675 individual cases of failure to work overtime as breaches of Clause 8 (5) (b) of the scheme. The London Local Board, although approving the issue of the appropriate form of enquiry in each case, felt unable on physical grounds alone to examine each complaint individually: in consequence, no effective action was taken and once again the impossibility of dealing with mass indiscipline under the Scheme was demonstrated."

As far as the latest strike is concerned, although the men have returned to work, there must be many who are wondering how long the uneasy peace will last, as there are no signs that a settlement has been reached between the Unions concerned. So far, the National Associated Stevedores and Dockers union has failed to establish its entitlement to recognition in the northern ports, and in fact its Executive have accepted the advice of the T.U.C. to hand the members back to the Transport and General Workers' Union. There is no doubt, however, that certain self-appointed leaders in the northern ports are using every endeavour to keep the issue alive.

Until solutions to the problems of union membership and the overall working of the Dock Labour scheme can be found, the situation will continue to cause anxiety in view of the disastrous effects of dock stoppages on the trade of the country. No other nation is so dependent on imports of essential food and raw materials which can be obtained only if they are paid for by a corresponding value of exports. A steady and uninterrupted flow of work at the docks is therefore of vital concern to all, including the dock workers themselves.

The recent strike is another piece of evidence which can be produced to support the demand for an urgent enquiry into the operation of the National scheme. So vital an industry cannot afford to have an unsatisfactory labour set-up.

Call for Dock Employment Inquiry.

As we go to press we learn that the board of directors of Manchester Chamber of Commerce, which represents 5,000 firms, has passed a resolution urging a full investigation into dock employment. After reviewing reports from members on the impact of the dock and rail strikes on import and export business, the Board decided to place the resolution before the Ministers of Transport and Labour. The resolution stated that "the cumulative effects of hold ups at the docks of inward and outward cargo has caused serious dislocation and losses to trade. The resultant lack of confidence abroad in Britain's ability to fulfil seasonal or other contractual obligations can only do serious harm to British interests." The Board felt, therefore, that it was essential in the national as well as local interests that all the facts relating to dock employment should be fully investigated.

Post-War Developments in the Port of Bristol

The Port's Progress as a Dock Undertaking

The Basis of Bristol's Progress.

BOLD capital investment in development is a tradition of the Port of Bristol for the spirit of commerce has always been a driving force. The advantages of the Port's physical geography are not inconsiderable but it has from the earliest times been necessary to engage in major engineering works in order to utilise them to the full. As long ago as 1239 the burgesses constructed a quayed trench along the River Frome, where its joins the Avon, in the heart of the City. The cost was £5,000 and it must have been one of the most expensive and ambitious public works of the age. In the beginning of the eighteenth century the third wet dock in England was being built within the Port and a hundred years later, in 1809, the 83 acre "Floating Harbour," which forms the City Docks, was complete. It had involved the expenditure of over half a million pounds in converting three miles of tidal river into a vast wet dock. The river was diverted through an artificial cut over a mile long and with an average width of over 100-ft. In the latter part of the nineteenth century and in the early part of the twentieth the Ocean Docks were excavated in the flat land around the mouth of the river at Avonmouth and Portishead and these docks systems now cover a water area of 110 acres. The current replacement value of the whole undertaking is estimated at £32 million.

Development by the Port Authority was followed up by private industrial and commercial interests and during the years between the two World Wars there arose the vast flour and provender mills which dominate the Avonmouth skyline and make Bristol the most important milling centre in the South-West, together with the installations of the petroleum companies and the nearby smelting and fertiliser works. In the same period the Port Authority built three new silo granaries increasing the total number to four, and considerably extended the Port's capacity for receiving shipments of general cargo and petroleum as well as grain.

A general view of part of Avonmouth Docks. The junction cut between the Royal Edward Dock and the Avonmouth Dock.

In 1945 Bristol as a world port had to look ahead with the prospect of being affected by such imponderables as the fortunes of the sterling area, the dollar area, post-war reconstruction in Europe, the vagaries of the Iron Curtain and other political factors. But the Port's economy would ultimately stand or fall with that of the country as a whole and the presence of the established industries referred to above was an assurance that the staple trades would continue.

The type of development to be engaged in by the Port Authority was also dictated to a certain extent by local factors. With one or two exceptions war damage had been slight and did not give opportunity for any major reconstruction, while expansion of the existing docks had reached its physical limit at Avonmouth before the War, with the building of the Oil Basin and the Eastern Arm Extension of the Royal Edward Dock. The course of progress, therefore, lay in the erection of additional buildings, the provision of more or better cargo handling facilities and general improvements in every feature of the undertaking, including its adjoining industrial estate. A further possibility remained—the accession of large new industries to the dock areas which would have to be provided with every encouragement. New industries did in fact come—including two large factories and a second electricity generating station. At Portishead particularly there has been a complete transformation of the dock scene through industrial development, which is described below. The Port Authority has integrated its policy with these new accessions and has also itself engaged in major structural work in connection with practically all the trades of the Port, both import and export, at Avonmouth, the City Docks and Portishead.

Development of Berths.

At Avonmouth, although there has been no expansion of the water area of the docks there have been some important developments in the Oil Basin. The establishment of refineries in the United Kingdom has caused an increase in the coastal oil trade and to deal with the increased traffic a new berth has been added involving 355-ft. of wharfage built up by sheet piling, while road access to all jetties has been improved. In addition to this a major scheme for consolidating the banks of the basin between the jetties has just been embarked on. These unprotected banks have been during recent years subject to slipping which is liable to affect the immediately adjacent pipelines. The probable reasons are numerous, including oil seepage, vibration in the pipelines, propeller wash, dredging and the normal effects of weathering on unstable material. At the present time dredging of the slipped material encourages yet further slipping. Consolidation will be carried out by continuous sheet piling up to 2-ft. above the water level. The expenditure involved will be heavy but when at any future time more berths are required an upper quay wall section can be easily added, as desired.

The main export berths in the Royal Edward Dock have also received considerable attention. At "X" Berth 1¼ acres have been levelled and concreted for the assembly of cars and the stacking and handling of other export goods. A third railway line has also been laid. Re-equipment of "T" Berth for the handling of export cargoes was completed in 1953. Five new 3-ton and two 10-ton cranes were installed, the railway layout renewed and the approach road widened for better access by lorries. Five capstans are installed to move trucks along the six railway tracks although most of the shunting work is carried out by tractors.

New Buildings.

For the import trades a number of new buildings have been or are being erected. A single storey steel-framed general cargo

Port of Bristol—continued

warehouse at the Royal Edward Dock with a capacity of 10,000 tons is nearing completion. This type of construction has considerable advantages. It is easier to adapt for some purpose for which it was not originally intended than is a substantial concrete structure and, taking an even longer view, cheaper to demolish if it should ever be necessary to remove it with also something recoverable from the scrap heap. Underneath the warehouse is a solid concrete sub-basement, with a flat-beamed ceiling, which is designed as a wine bond with a capacity of 8,000 hogsheads.

Provision for the timber import trade has been improved by the recent completion of an open steel-framed shed on the West Wharf giving covered storage for a thousand standards. At the same time a reorganisation of the stacking ground behind the quay has been carried out and the handling of timber cargoes made easier by the removal of the terminal of the aerial ropeway, which carries ores and fertilisers, to the other end of the wharf.

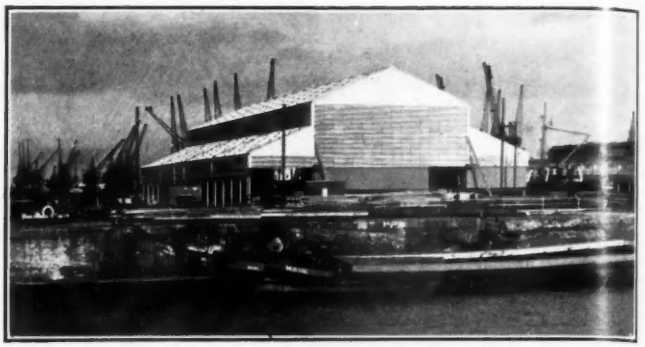
The handling of hazardous goods in Avonmouth has now been given improved facilities by the building of a new shed behind the Royal Edward Dock in a more readily accessible position than the old one in the Avonmouth Dock area.

Reconstruction in the City Docks.

In the City Docks the only major work of reconstruction necessitated by war damage was carried out several years ago. On the site of a large floor granary at Prince's Wharf, which was destroyed in an air raid, it was decided, in view of the transfer to Avonmouth Docks of the pre-war North American grain trade, to erect twin double-storey general cargo transit sheds of brick construction with steel frames. The sheds have a total floor space of 6,650 square yards and are provided with four 2-ton electric hoists and two electric capstans for the quayside railway. The hoists are installed at the rear of the sheds for delivery to road or rail from the first floor. At the present time there are seven new 2-ton electric portal cranes and one 10-ton crane on the wharf but three of the former are to be altered to lift three tons in connection with recent developments in the Guinness trade with Dublin. Hitherto Guinness has been carried in the traditional wooden barrels but an increasing demand by English bottlers for bulk delivery of supplies has led, after extensive tests, to the introduction of steel tanks for transport. These tanks will be landed to special fork-lift trucks on the quay and conveyed to nearby insulated cells where they will await transfer to road vehicles for direct delivery.

About two years after the war considerable alterations to the Bathurst Wharf, City Docks, were made. The verandah of the shed and the over-head gantries were removed and four 3-ton electric cranes installed; at the same time new sidings with capstans were laid out.

The new sub-basement Wine Bond, with a capacity of 8,000 hogsheads at the Royal Edward Dock. Above this Wine Bond there is a newly completed General Cargo Warehouse with a capacity of 10,000 tons.



A new timber shed providing covered storage for 1,000 standards, recently completed at the West Wharf, Avonmouth Docks.

At the Baltic timber wharves two 65-ft. jetties were constructed in 1951 while Brandon Wharf was cleared, levelled and re-surfaced for the building of a small warehouse for waterborne traffic.

Mechanical Handling.

Mechanical handling of cargo has a long tradition in the Port of Bristol, which may even claim some devices almost unique in British ports—it was after all a Bristol stevedore who introduced the original "Gadget" over a century ago. The application of new mechanical handling methods has always been initiated with forethought, and with the co-operation and understanding of the workers concerned so that they may see them as an advantage in the speeding up of output under piece-work conditions rather than as a threat to employment.

The mechanical handling of bulk commodities such as grain and ores was introduced long before the War. Even the fork-lift truck and similar vehicles are not entirely a post-war innovation but during the war years Bristol had the opportunity of studying American methods in the latter type of handling, and there are now some fifty vehicles of this class working at Avonmouth. In building up this substantial fleet, careful study has been given to the comparative advantages of battery-operated and internal combustion engined vehicles. Diesel and petrol trucks have at the present time the higher travelling, hoisting and lowering speeds but electric trucks are found to be cheaper to maintain; they suffer from the disability of requiring frequent and regular battery-charging, but they have a longer life and of course emit no fumes, and the Port Authority is now acquiring experimentally electric trucks with an improved speed of operation.

The standard fork-lift truck used has a lift of 9-ft. but the fleet includes a number of tall-masted vehicles providing a lift of 14-ft. to facilitate the stacking of cargo to maximum height in the Port warehouses. Besides handling palletised cargo the trucks are used for stacking ingots of aluminium, casks, barrels and tierces and large packages. A special jib attachment is employed for the stacking of casks of wine in the wine bond, and the standard machine has also been adapted for the handling of casks of tobacco by the fitting of elongated forks. With these forks it is possible to stack the casks in the Transit Sheds in three tiers by the end-on method which shows a great improvement, both in stacking and delivery operations, over the earlier practice of lifting the casks on the roll.

Although fork-lift and raising platform trucks are often thought of as "maids-of-all-work" the Port Authority recognises their limitations very clearly. Their use for conveying loads over distances exceeding, say, two hundred yards would be clearly uneconomical and this function in the handling of palletised cargo is taken over by 22-ft. flat-bed trailers, of which there are nine in service with three motive units.

Minor improvements in the operation of trucks have been the fitting of rubber tyres to reduce wear and tear on floors and the painting of vivid bands on the battery trucks so that they may catch the eye of those they might otherwise take unawares by their silent approach.

Port of Bristol—continued

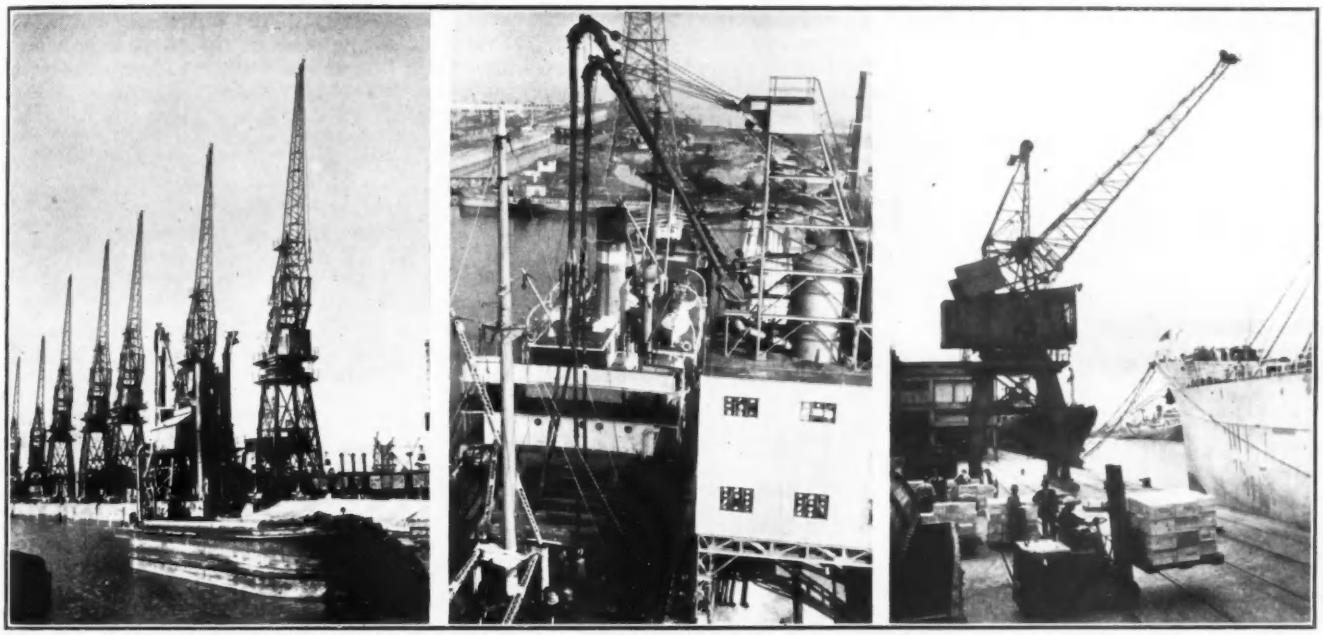
Since the war the utilisation of mobile cranes in British ports has extended considerably and the Port of Bristol Authority now operates a varied fleet of these vehicles at Avonmouth and Portishead Docks. Both tracked and tyred vehicles are used; they are mostly petrol-driven but a few are diesel-engined. Their uses range from the handling of heavy logs on the quayside to the stacking of crated export cargo in transit sheds.

For some years a straddle carrier has been operated by the Port Authority and this machine has proved so useful that a second one has now been acquired. Lifting 6½-tons of log or sawn timber at a time, these vehicles are invaluable for keeping the quayside clear of congestion. Other mechanical equipment introduced in recent years includes portable electric and petrol-driven conveyors and piling machines, pallet trucks, tea packing machines and various types of automatic weighing appliances.

Cranes are the most old-established form of mechanical handling in the port—a heavy lift crane was in use as long ago as the seventeenth century. In Europe at least they are generally regarded as a good measure of a port's efficiency and importance, and in this connection it is worth noting that Bristol has produced two ships, engaged on a regular route to the Continent, which have been built without any cargo handling gear at all, relying entirely on the terminal facilities provided. At Avonmouth in 1953 twenty new 3-ton and three 10-ton electric wharf cranes were installed at "Q," "R," "S" and "T" Berths. They are level luffing cranes working on A.C. and incorporate the features most needed for dock working—high operational speeds with as large a number of cycles per hour as possible, a long enough jib to cover the shore area, a good view from the driver's cabin and simple maintenance. These standard 3-ton cranes have a hoisting speed of 240-ft. per minute and a controlled lowering speed of 400-ft. per minute.

At the West Wharf on a strengthened quay five new 5-ton grabbing cranes were brought into use at the end of last year for the discharging of bulk ore and fertiliser cargoes to the aerial ropeway or direct to road or rail transport. The ropeway has a capacity of 221 tons per hour, serving the National Smelting Co.'s works and also those of Fisons Ltd. As already mentioned the ropeway terminal has recently been transferred to the inner end of the wharf and in connection with this change the opportunity has been taken to introduce a new method of operation. Whereas before the buckets were removed from the endless rope on to trolleys on the ground haulage system and so taken to the hoppers they now stay on the rope throughout loading. The hoppers have been fitted with vibrators to speed up the filling of the buckets.

The pattern of the railway system at Avonmouth is an established one and the changes in layout have been of a minor nature, but a long term plan is in operation for large scale renewal of the tracks and use is being made of concrete sleepers to a considerable extent. There has, however, been an opportunity for modernisation of the rolling stock. Of the 1,300 or so internal-user wagons over half have been replaced since the war and an increasing number of bulk grain vans are being introduced in response to the increasing demand for this type of delivery to dockside mills. In haulage a complete revolution is in progress. In the past 0-6-0 saddle-tank steam locomotives have performed haulage duties faithfully and well but the advantages of the 300 b.h.p. diesel locomotives capable of drawing 1,000 tons, which have been introduced, are apparent. The fuel range is greater, none is wasted in raising steam, water softening plant is unnecessary and decreased operational costs with higher overall efficiency result. The risk of fire is also very much less, an important consideration at Avonmouth where there are such extensive petroleum installations within the dock area. At present there are eight diesel locomotives in action, including one at Portishead, and six more are on order and ultimately steam power will be entirely replaced.



1 (left) Five new 5-ton Grabbing Cranes at the West Wharf, Royal Edward Dock, Avonmouth. These cranes are used for discharging bulk mineral and fertiliser cargoes to an aerial ropeway or, if necessary, to road and rail transport. 2 (centre) Discharging Phosphate Rock by suction elevator to the Chemical Factory at Portishead. 3 (right) Australian canned fruit being landed to the quay for sorting to pallets and transference to store by fork-lift truck.

Wagon movements are also carried out by the use of electric capstans, but shunting tractors have come into use to an increasing extent since the war and in some parts of the Docks have effected a great saving in capstan work and hence in labour costs.

With the acquisition of new locomotives new accommodation has been provided by the complete replacement of the running sheds with a steel-framed brick-panelled structure provided with inspection pits fitted with built-in fluorescent lighting.

Development in mechanical handling has by no means been confined to vehicles. The increasing demand for bulk grain delivery already mentioned has brought a decision to alter No. 2 Granary, hitherto only used for storage. It is proposed to use the belts in the basement to feed, through the re-elevating elevators, to new conveyors to be constructed, one on each of the outside walls. These new conveyors will be used for loading internal user bulk vans to supply the mills around the docks.

Port of Bristol—continued

At the Royal Edward Cold Stores delivery facilities have been improved in the last year by extending the covered loading platforms around three sides of the building; the approach roads have also been widened. These works, together with the installation of two additional 4-ton lifts in "O" Shed and the purchase of additional meat trolleys, have been planned to facilitate the internal movement of frozen meat and dairy produce under the changed trading conditions now in evidence.

Other Engineering Developments.

One of the engineering developments of the post-war period which, in its way, has affected the Port scene as much as any other is the steady improvement in the lighting of berths for night working and great use has been made of the new types of light source now available, although the conventional tungsten lamp still holds its place for many purposes. The sodium vapour lamp is extensively used for the floodlighting of open spaces, such as the "X" export berth, roads, lock entrances and the dry dock. Mercury vapour lamps are used near the petroleum berths as the accidental dropping of a sodium lamp could cause a fire if the metallic sodium came into contact with water. On the oil jetties themselves only certified flameproof equipment is permitted.

Tungsten lamps are still commonly used during shipworking for cranes, quays and sheds to provide relatively short periods of lighting with good colour characteristics for cargo handling.

Inside sheds lighting has been adapted to the higher stacking of goods and the use of chain suspension minimises the risk of damage to installations by the jibs of mobile cranes and the activities of other mechanical handling equipment.

In the Dry Dock area sodium vapour floodlights are placed well back so as not to obstruct daylight working; danger is minimised and a wide diffusion of lighting facilitates ship repairs and movement. Since the completion of the raising of the height of the blocks by 8-in. in 1953 and the substitution of cast-iron for wooden blocks the graving dock has been capable of accommodating two ships at the same time should the necessity arise.

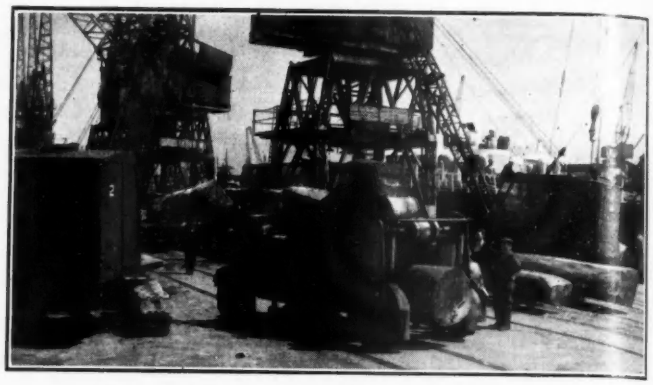
Passing from electricity to electronics the Port's dredging fleet has been equipped for some years with radio-telephony which keeps it in touch with the shore signal stations. The Port's survey launch "Research" is a post-war acquisition and is fitted with echo sounding gear. After experiments with various types a radar scanner has now been established at the main entrance locks to the Avonmouth Docks.

Routine dredging is imposed on the Port of Bristol Authority as it is on most harbour authorities, but the expenditure is not unduly high and compares very favourably with other leading ports. The Port Authority has been fortunate in acquiring dredgers which have given sterling service over a great many years. The oldest, a combined hopper-dredger, was replaced two years ago by a new dumb dredger and steam hopper forming a far more satisfactory working unit for the Avonmouth Docks. In the City Docks a new bucket ladder dredger and two twin-screw diesel hoppers are being built to take over work in that part of the Port. In the light of these new acquisitions it is interesting to note that in the Basin entrance to the City Docks a 120 year old "drag-boat" dredger built to designs by Isambard K. Brunel still performs a specialised task efficiently and demonstrates that there is no point in dispensing with an old and sound idea merely for the sake of modernity.

Industrial Progress.

The most striking industrial developments within the Port have taken place at Portishead. Some years before the war the Port Authority was seriously considering taking Parliamentary powers to close this dock, which has had a somewhat chequered history, but a change came with the building of the first power station using coal imported by water from South Wales. The Central Electricity Authority is now engaged in the construction of a second power station half as big again as the first one, and imports of coal, at present about 50,000 tons a month, are expected to increase considerably.

The power station development was followed by the siting of a new phosphorus factory on the opposite side of the dock by a Midland chemical firm. This £3 million factory imports phosphates in bulk from foreign sources and produces liquid phosphorus which is sent away in rail tankers as chemical raw material. The ship discharging plant on the quayside provides the first known instance in Britain where suction elevators have been used to discharge chemical raw materials. The natural weight of the commodity, calcium phosphate, means that very powerful plant has had to be provided but a satisfactory discharging rate of 300 tons per hour has been achieved.



Hardwood logs being handled by mobile cranes and straddle carrier on the West Wharf, Royal Edward Dock, Avonmouth.

Side by side with these developments the Port Authority has installed new electrically-operated lock gates at Portishead Dock. They are of the flotation type with air lift pumps served by a portable compressor and are swung by eight electric winches in a matter of 60 seconds. Their design was carried out by the Authority's own Engineering Department.

Most of the South Wharf has been improved by re-alignment and sheet piling and part of it continues to be used for the discharge of timber cargoes from the Baltic. Behind the dock the railway services have been completely transformed with the building of a new station on a different site and the laying out of new marshalling yards.

The process of integrating industry with the dock undertaking has been furthered at Avonmouth by the Port Authority's Trading Estate at Chittening covering an area of 720 acres adjacent to the Docks. Since the war more than two miles of new roads have been constructed in conformity with a planned and orderly layout of sites and 5,500 yds of railway sidings have been laid. As a result the Port Authority is able to quote rates for receiving goods direct ex ship and delivering to places on the Estate and vice versa. An important recent acquisition to the Estate has been a £2¼ m. carbon black factory, with a potential output of 20,000 tons per

A fork-lift truck delivering casks of tobacco to lorry at the Royal Edward Dock, Avonmouth.

Port of Bristol—continued

year, which went into production in 1950 and is the largest plant of its kind outside the United States of America. It is able to receive its raw material supplies of gas oil direct by sea.

All the buildings on the Estate have been taken over by warehousing and light engineering firms and processing and packing depots, but a number of attractive sites are available for the erection of factories, works, warehouses, depots and such buildings.

Future Development.

During the last ten years the Port Authority has increased its capital investment by about £1¾m. and the trade of the Port measured by the total number of tons of goods handled amounts to some 7m. annually, an increase of 2m. tons over 1938-39, which was a record pre-war year. It is also satisfactory to note that, under the financial conditions to which the Port Authority is bound as a municipal undertaking, two thirds of the original capital investment now stands repaid and that the repayment of the remainder may be looked forward to in the not too distant future, leaving the Dock Estate free of debt.

Much of the development described above has come to fruition in the second half of the post-war period although the plans may have been laid in the first half. This has been caused by the general economic state of the country with the restrictions on capital expenditure which were enforced, the one time shortage of steel and the delay in the delivery of materials generally. During the next five years it is reasonable to assume that development will be able to be undertaken more readily in anticipation of the demands which may arise. It it not expected that there will be either a spectacular increase in trade as a whole or any significant decrease. The national volume of trade has an ultimate limit and Bristol's share is likely to remain fairly stable. Outstanding developments are most likely to come in connection with newly established dockside industries, of the type now at Portishead. Such factories form a sort of "gilt edged" hinterland; with factories further afield there is always the prospect of competition from other ports, which is non-existent in the case of a firm which receives raw material direct from the dock.

Sodium Vapour Floodlights illuminate this open berth with its assembly of cars for shipment to Australia and New Zealand.

Although there are no present indications of any substantial increase in the Port's trade it should not be assumed that no consideration is being given to future development of the Docks systems. On the contrary alternative schemes for extending the Port's facilities have been planned in some detail and these are kept up-to-date in accordance with changing conditions. But schemes of this sort are particularly costly and it always has to be borne in mind that in this country the greater proportion of the capital assets of any Dock Undertaking are only used for about one-third of every day, in contrast to the practice in Continental ports where two and even three shifts are worked daily. In view of the local and national labour situation shift working is not at present practical politics but it is doubtful whether large scale dock extension is either. It may rather be that the future trend will be towards the improvement of existing facilities by the erection of new buildings or the modification of existing ones, and constant attention to the application of the latest techniques in mechanical cargo handling by way of supporting the Port Authority's continuous efforts to improve outputs.

British Waterways Improvement Scheme

First Part of Major Development Plan

With the completion of the separate Waterways Division, under a General Manager, which was set up by the British Transport Commission in January this year to manage the canals and inland waterways under their control, and following the recent Report of the Board of Survey on Canals and Inland Waterways, the Commission announce the following development plans, works and proposals. These are additional to the £2m. already spent on making good arrears of maintenance and on new works and facilities, and represent only a first instalment of the major schemes which are envisaged for the full development of those waterways which are of real value as part of the national transport system.

Trent Navigation

A £150,000 scheme is to be carried out in connection with this waterway, which carries a substantial general cargo traffic from the Humber ports, largely to the Nottingham area. The scheme is designed materially to increase this traffic to Nottingham and comprises three inter-related proposals.

(a) **Nottingham Depots.** A total of £90,000 is to be spent at the Trent Lane and Meadow Lane depots. A transit shed at Trent Lane, destroyed during the war, is to be replaced and additional cranage and other facilities provided. At Meadow Lane the riverside frontage is to be extended to allow three additional berths, a new storage shed is to be built and new mobile cranes and other equipment provided.

The depot at Colwick, four miles downstream from Nottingham, and held by the Commission on lease, is to be vacated. It was used mainly for lightening the larger Trent craft—a need which has disappeared following work carried out at Newark, where a large modern lock has been built at a cost of over £70,000, and at Holme. The effect of these works was to enable craft of 200 tons to navigate to Nottingham. Previously they could not pass beyond Colwick.

(b) **New Carrying Craft.** Two new powered carrying craft of standard Trent size (150 tons) are to be purchased at an estimated cost of £22,000.

(c) **Wincolmlee Wharf (Hull).** The sum of £40,000 is to be spent on re-equipping and expanding this depot, at which the sand and gravel which is the principal down river traffic on the Trent is processed and sold. The work is designed to achieve a better balance of up and down river traffic.

The scheme as a whole should increase considerably the Commission's carrying and warehousing activities on the River Trent.

Leeds and Liverpool Canal

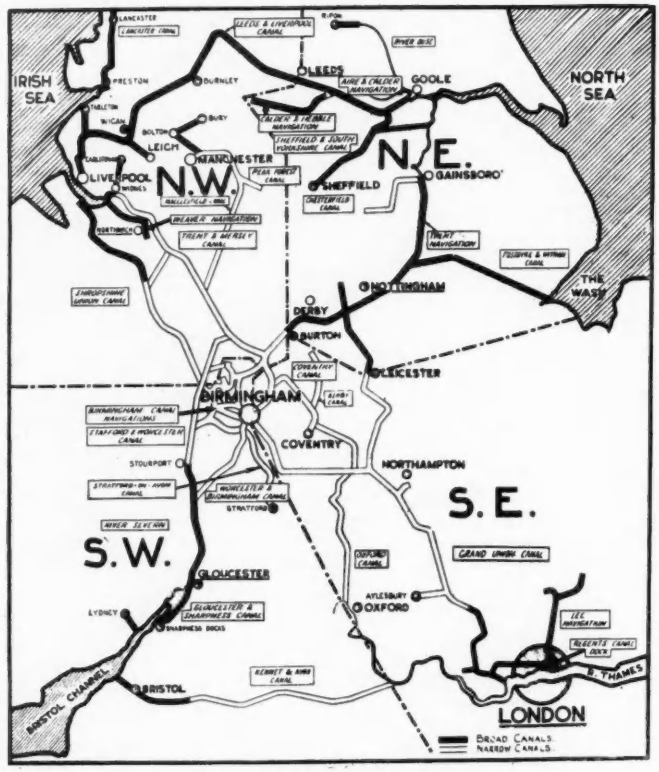
New workshops for all major engineering work in the northern district of British Transport Waterways' North Western Division are to be built at Wigan at a cost of £67,000.

The installation will comprise a 430-ft. long steel-framed building, sub-divided to house shops, garage and slipway, on a 2-acre site which has an existing dry dock. When completed the workshops will be able to undertake repairs to the Commission's carrying craft and also the construction and repair of lock gates, bridges, etc., at present carried out at a number of small establishments throughout the district.

A £15,000 warehouse at Church, also on the Leeds and Liverpool Canal, has recently been completed to serve the increased needs of the textile machinery industry in this area. Machinery for export is canal-carried from Church to the Mersey ports, where it is loaded overside direct to sea-going ships.

Equipment at the new warehouse includes an overhead electric

British Waterways Improvement Scheme—continued



Map of British Inland Waterways.

travelling crane with a gantry extension to the opposite bank of the canal.

Aire and Calder Navigation

A £350,000 traffic development scheme for this active and important waterway is at present being examined by the Commission.

The Aire and Calder Navigation is a main artery between Yorkshire's West Riding area and the ports of the Humber. It extends from Goole to Leeds (where it joins the Leeds and Liverpool Canal) and Wakefield (where it joints the Calder and Hebble Navigation), and is navigable by craft of 250 tons to Leeds and 170 tons to Wakefield.

The Commission's merchandise carrying fleet in this area is at present served by eleven depots on the Aire and Calder and Calder and Hebble. The scheme now being examined is designed to eliminate uneconomic dispersal and dissipation of effort by providing modern terminal facilities at one central depot and to augment the fleet of powered carrying craft.

(a) **Knostrop Depot.** It is proposed to build a £230,000 installation on a 28-acre waterside side at Knostrop, about 1½ miles downstream from Leeds. On this site, which is linked by road with Leeds and West Riding towns, a single storey storage/transit shed with a 12,500 tons capacity will be erected on a 600-ft. long steel-piled wharf which will have eight berths for standard craft. Handling equipment will include mobile diesel electric cranes, fork-lift trucks and shed trucks with pallets and boards. A service garage and repair shop for road vehicles will also enable waterway craft to be provided with fuel, stores and minor engine repairs.

(b) **Carrving Fleet.** The concentration of activity at one modern depot at Knostrop will enable the Commission's carrying vessels to engage more fully in the substantial trade between the Humber and West Riding and it is proposed to strengthen the fleet at a cost of £115,000 by purchasing nine new craft of standard 105 tons design, powered with diesel engines, and by increasing the cargo capacity of four existing craft by modifications.

River Severn

The important oil trade on the River Severn has led to the establishment of a big oil depot at Diglis, in the inland port of Worcester. Development work is continuing on reclaimed land made available by the Commission to the oil companies which have set up large storage and distributive centres there.

Future Plans

British Transport Waterways are actively engaged in the formulation of many large improvement schemes, as recommended by the Board of Survey. These will include the reconstruction and enlargement of locks, bank protection, dredging, the construction of new carrying craft and the provision of additional handling and terminal facilities.

Opening of the Holme Sluices

Important Improvements to the River Trent

One of the principal items of the Nottingham Flood Protection Scheme was formally inaugurated on May 5th, 1955, when the Duke of Edinburgh declared the Holme Sluices open. These sluices are part of an integrated scheme which provides for flood control at Nottingham, and at the same time enables larger vessels than hitherto to reach Nottingham from downstream. The rest of the scheme is rapidly nearing completion.

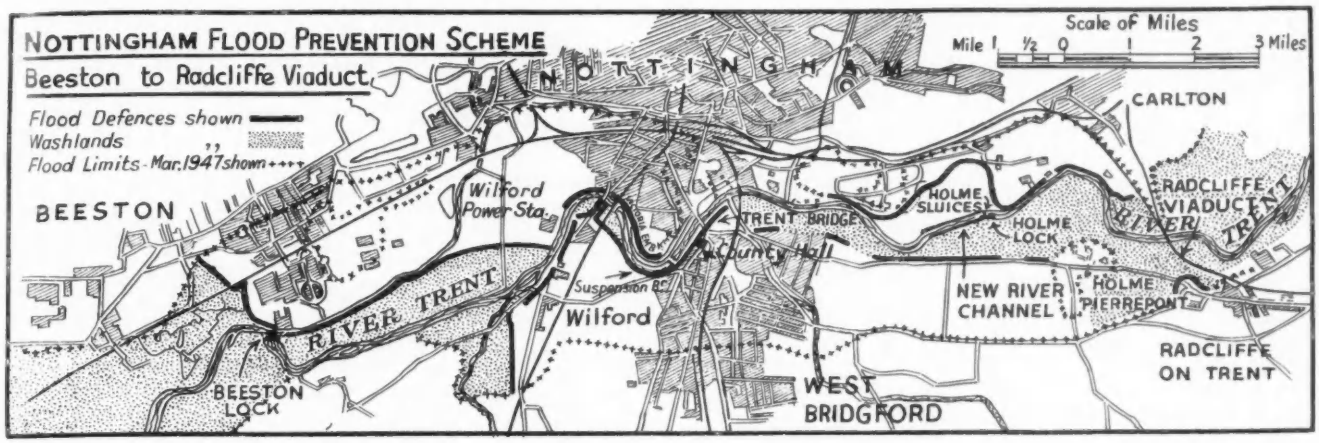
Historical.

The valley of the River Trent has always suffered periodical inundation. The earliest recorded flood was in the year 1346 when, according to reports, "from midsummer to Christmas the rains fell almost without intermission." More than 400 years later the flood of February 1795 is reported to have been "the largest flood for perhaps two centuries." In more recent times major floods have occurred in October 1852, October 1875, January 1901, December 1910, May 1932, February 1946, and March 1947. This last flood, which affected most of the country, was caused by extreme frost and snow followed by thaw and rain, conditions similar to those prior to the February 1795 flood. The peak levels reached by these seven floods at Trent Bridge, Nottingham, vary between 79.45 and 80.67-ft. above mean sea level at Liverpool, compared with the normal level of 68.0-ft. The highest was that of 1875 which was six inches higher than the level reached in 1947. It is significant that at the end of the eighteenth century there was very little urban development on the flood plain, especially on the Nottingham side of the river, and the subsequent urban development, together with the raising of the level of the washlands, has materially increased the danger of flooding by attempting to restrict the flood waters to the actual river channel.

The major flood of May 1932 occurred within a year of the formation of the River Trent Catchment Board and many properties were flooded within the Nottingham area. Subsequently alternative schemes for dealing with the problem were investigated. The commitments of the Board elsewhere however precluded an immediate start on a flood protection scheme for the Nottingham district and the outbreak of War in 1939 postponed any further work on such a scheme.

In February 1946 another major flood occurred and it was then decided to proceed with the preparation and carrying out of a flood protection scheme. With the approval of the Ministry of Agriculture and Fisheries arrangements were made for Professor Thijsse to construct a hydraulic model at the Delft Hydraulic Laboratory in Holland to investigate the problem. At that time facilities did not exist in England for the early construction of such a model. During the construction of the model a further major flood occurred in March 1947 which was higher than the previous floods of 1932 and 1946 and flooded an area of approximately 6,000 acres including 7,240 factories and houses in the city of Nottingham and the urban districts of West Bridgford, Beeston, and Carlton on a reach of the river only 10 miles long. Over thirty different schemes were investigated on the model and it was also

Opening of the Holme Sluices—continued



Plan of scheme finally adopted.

proved that the effect of any scheme would not raise the maximum flood levels below Radcliffe Viaduct. After the completion of the model experiments, there followed negotiations with Local Authorities, British Waterways and certain riparian interests and a final scheme was adopted in 1949. Later agreement was reached with the National Coal Board as to the leaving of a pillar of coal under the sluices and the adjacent locks for support purposes.

The Board is receiving a Government grant of 40 per cent. of the cost of the Scheme through the Ministry of Agriculture and Fisheries, and anticipate certain contributions towards the cost from neighbouring local authorities. British Waterways are also contributing as the scheme is of great benefit to navigation in that larger vessels which previously could not pass through Holme Cut can now reach Nottingham.

DETAILS OF THE FLOOD PROTECTION SCHEME.

The Scheme adopted is now estimated to cost approximately £1,100,000 and for convenience is divided into three sections as follows:—

Beeston to Wilford Power Station.

In this Section the work consists mainly of the building of earthen floodbanks, with a short section of concrete floodbank units, and the raising of lock gates and lock walls at Beeston Lock and the main L.M.S. railway line at the point where the floodbank had of necessity to cross the railway. Work was commenced on this section in May 1950 and substantially completed during the following winter.

The main Contractors on this section were Tarslag Ltd. of Rotherham and the final cost will be approximately £108,000.

Wilford Power Station to Trent Bridge.

This section was the one where most difficulty was experienced in obtaining agreement with the various interested authorities. A scheme to include two dry by-pass channels across the river bends at Wilford and the Suspension Bridge for use in flood times only, in addition to the existing river channel, was hydraulically preferable but owing to the unavoidable interference with the War Memorial Gardens and other properties it was eventually decided by agreement with the local authorities to carry out a river widening scheme, together with the construction of the necessary flood defences. This included the demolition and reconstruction of 4,600-ft. of existing concrete stepped embankment, the setting back of the Victoria Embankment Road for a length of 1,700-ft., piling work and the provision of new flood arches at the Suspension Bridge, and also flood embankment and concrete flood walls. Work was commenced in April 1951 and substantially completed by June 1953. The main Contractors were The Mitchell Construction Company of Peterborough. The final cost of this section is expected to be of the order of £370,000.

Trent Bridge to Radcliffe Viaduct.

The main work on this section is the Holme Sluices, which replace the abandoned Colwick Weir. As explained previously, the requirements of navigation necessitate a step of 10-ft. in water level at Holme Lower Locks during periods of low river flow. The other major item is the straightening of the river channel near Colwick Weir to cut out the tortuous loops of the River Trent which wind for a distance of 2,500 yards between Holme Lower Lock and Holme Upper Lock, and to widen the navigation cut between the two locks from 60-ft. to 300-ft. to form a straight channel of only 700 yards in length. This item was specially authorised by Parliament in the Trent River Board Act, 1951. In the March 1947 flood there was a difference of 4-ft. 4-in. in flood level between the two locks which, after the scheme had been completed, will be reduced to 11-in.

Holme Sluices.

These consist of five 40-ft. wide steel lifting gates, each 16-ft. 6-in. deep and are probably the largest automatically operated battery of sluices in Great Britain.

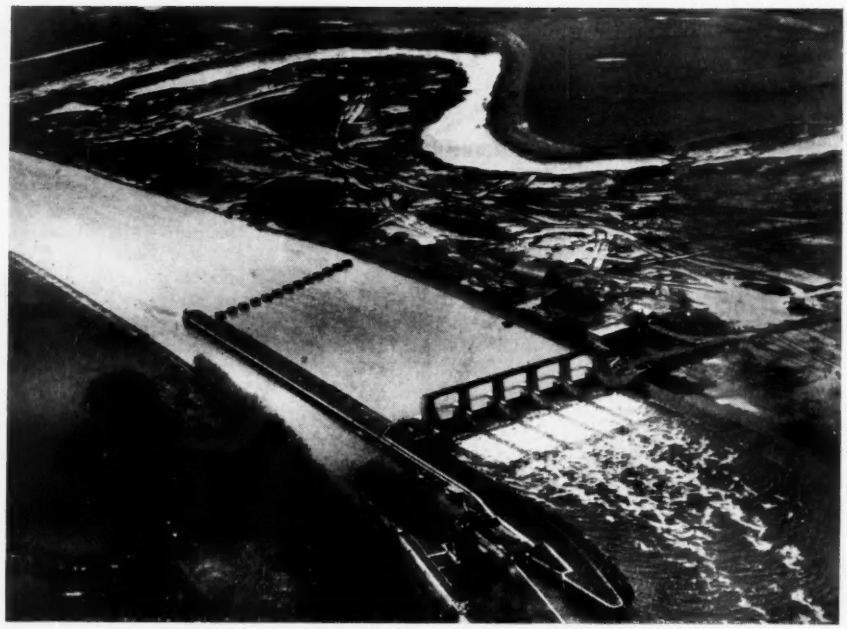
The sluices replace the old Colwick Weir, and are designed to maintain a difference in water level of approximately 10-ft. at low

Aerial view of Colwick Weir and Loops.

Opening of the Holme Sluices—continued

summer flows. The adjacent Holme Locks of British Waterways pass both commercial barges and private pleasure craft through this difference in level. The aerial photograph of the sluices shows the locks in the foreground.

When the flow in the river increases due to rain or melting snow, floats underneath the control house operate the automatic electrical controls and, by means of electric winches on the superstructure, cause the gates to be raised 4-ins. for every ½-in. rise in upstream water level. The control house is situated just upstream of the sluices on the left bank of the river. The automatic control ensures that the river levels upstream of the sluices are kept as low as possible without, of course, lowering the water level below that required for navigation. As the flow in the river increases, a rise in the upstream water level of 2-ft. will correspond to the gates being raised 18-ft. above the sill. At this stage a secondary automatic control comes into operation and the sluice gates are lifted a further 6-ft. completely clear of the water level,



Aerial view of Holme Sluices.

thereby allowing an unobstructed river flow. When the river levels begin to fall again the reverse happens. Water level indicators are installed in the control house, to show on dials the river levels both upstream and downstream of the sluices and to record both levels on a revolving chart. The electrical mechanism has two alarm circuits, one to sound an alarm bell if the electricity supply should fail; the other to operate a second alarm bell in the event of any electrical or mechanical failure causing the relative positions of the gate opening and the upstream water level to be "out of step." The raising or lowering of any of the five sluices can also be carried out by an alternative "push button" control either from the control house or from the superstructure. In the control house a standby electric generator is provided in case of a failure in the electricity supply. As a further safeguard, the sluices can be manually operated from the superstructure girders.

A house for the Sluice Attendant has been provided adjoining the control house, together with separate accommodation for an additional attendant. In the event of a major flood occurring, it will be advisable to switch off the "automatic operation" and work by "push button control," and lower the water level below the normal retention level to assist drainage from subsidiary watercourses and storm water outfalls before the peak of the main flood reaches Nottingham.

The site of the sluices and the control house and Attendant's House has been raised well above major flood level, but the access road to the sluices will be flooded during major floods. This access road is across essential washlands and could not have been raised without the provision of expensive viaducts. It should not be necessary, however, to have road access to the sluices during the short period of a major flood, provided that the sluices are attended.

The Contract for the fabrication of the sluices was awarded to Ransomes & Rapier Ltd. of Ipswich on 4th August 1950, with a delivery period of two years.

Unfortunately, the shortage of steel and the advent of steel rationing and the inability of the Ministry of Agriculture and Fisheries to grant the necessary licences for steel until the last quarter of 1952, delayed the fabrication of the sluices. The Contract for the civil engineering work at the sluices and the adjacent steel piling and other works was awarded to Sir Robert McAlpine and Sons (Midlands) Ltd. on 3rd February 1953. By the 27th June 1953, the new temporary bridge over the River Trent at Colwick, the access road to the site, the cofferdam and the main excavation had all been completed.

The main sluice structure was substantially completed by 28th November 1953 and the erection of the sluices under the supervision of Ransomes & Rapier Ltd.'s Erector was started on 17th November 1953, and completed on 14th April 1954.

The painting of the sluice gate was carried out by Wailes Dove Bitumastic Ltd., who used altogether four tons of bitumastic enamel for the five sluices. The painting of the overhead girders, railings, etc., was carried out by Kirby McLean Ltd. using "Ferrodo" paint.

The Contract for the widening of the Holme Cut, the filling in of the old loops, other river widening and the construction of floodbanks, was let to Tarslag Ltd. of Rotherham. Work was commenced on 19th March 1954, and is scheduled to take eighteen months to complete. More than one-third of the new widened Holme Cut was excavated by June 2nd, 1954, and the sluices brought into manual operation on that date. Colwick Weir was successfully dammed off on June 4th. Unfortunately heavy rain started on June 5th interrupting the progress of the work and causing some erosion, and the excavation of the new river channel was not completed until November 1954.

Work on widening the river above the new river channel proceeded slowly during the winter, and the work is now speeding up on both banks of the river upstream towards Trent Bridge.

The installation of the electrical equipment for the automatic control of the sluices commenced on June 9th, 1954, and was finished on 26th September, since when the sluices have been on automatic operation.

One further contract has to be let. This is for the remaining flood defence works mainly on the left or north bank of the river between Trent Bridge and Radcliffe Viaduct. It is hoped that work will commence on this final phase almost immediately.

The cost of this section is estimated at approximately £620,000.

Testing of the Scheme during the March 1955 Flood.

On the afternoon of Friday the 25th March, 1955, the river level at Nottingham was only 1-ft. 3-in. above normal summer level. Heavy rain occurred over the whole catchment area amounting to between 1½-in. and 2-in. over a period of 48 hours. Owing to the partially frozen state of the land, this resulted in a major flood of approximately the same intensity as that of May, 1932. If the scheme had not been substantially completed, this would have resulted in extensive flooding in Nottingham and West Bridgford. The sluices were raised clear of water level on Sunday morning, 27th March, and the new river channel operated to reduce the peak flood levels. The new flood defences upstream of Trent Bridge effectively prevented any danger of flooding from the river. The data obtained from this flood has confirmed that the scheme has been designed on a sound basis.

River Thames Pollution

The Evolution of Gas from the Bottom Deposits of the Estuary

By J. GRINDLEY, Ph.D.
(Water Pollution Research Laboratory, Stevenage, Herts.)

The following foreword to Dr. Grindley's paper has kindly been supplied by the Water Pollution Research Laboratory:

"Maintaining the purity of rivers has become a major problem in many parts of the world. In Great Britain, for example, waterborne sewage from some 40 million people (amounting to perhaps 1,500 million gallons per day) has to be discharged after treatment to rivers, or on the coast to estuaries or to the sea; and almost every industry produces polluting waste waters which similarly have to be treated and discharged. At the same time a substantially similar volume of water has to be taken from rivers or from underground sources for domestic supply and for industrial use. Although natural processes of self-purification occur in streams, the extent to which polluting matter can be removed in this way is strictly limited and it is therefore necessary to take elaborate precautions to prevent the discharge of excessive quantities of polluting matter, either of domestic or industrial origin. In England and Wales pollution is controlled by River Boards who usually employ chemists and sometimes biologists to assist them in this work: somewhat similar Boards have recently been set up in Scotland.

"Although much is now known about methods of treating polluting liquids, there are still many problems which can be solved only by carrying out research in a laboratory or on a large scale. To assist in solving these problems the Department of Scientific and Industrial Research set up the Water Pollution Research Laboratory in 1927. Its duties are to carry out research on the treatment of water, sewage, and industrial effluents, and on the effects of all types of polluting substances when discharged to natural waters; and to advise industry, local authorities, and others, on methods by which pollution can best be avoided. It works in close contact with other laboratories of the Department, with Government Departments in Great Britain, Northern Ireland, and the Commonwealth, and with municipal authorities, water undertakings, and industry. Its staff includes chemists, biologists, and physicists.

"Until 1954 the Organisation was housed in a number of temporary laboratories with a Headquarters at Watford. All these, however, have now been closed and the whole staff is accommodated in a new Laboratory at Stevenage. This building, which was specially designed for the work, includes offices and a library, small-scale and pilot-scale laboratories, constant-temperature rooms, well equipped workshops, and a canteen. There are facilities in the grounds of the station for carrying out large-scale experimental work on the treatment of sewage, up to 70,000 gallons of which can be pumped daily from a domestic sewer which crosses the site. It is of course still necessary to work from time to time at factories, sewage works, and other places, and to make observations on polluted and unpolluted rivers in different parts of the country. Work of this kind is usually done by sending out a team with portable equipment carried in a van or lorry, and one section of the Laboratory is continuously engaged on the development and construction of automatic recording apparatus to facilitate this type of work."

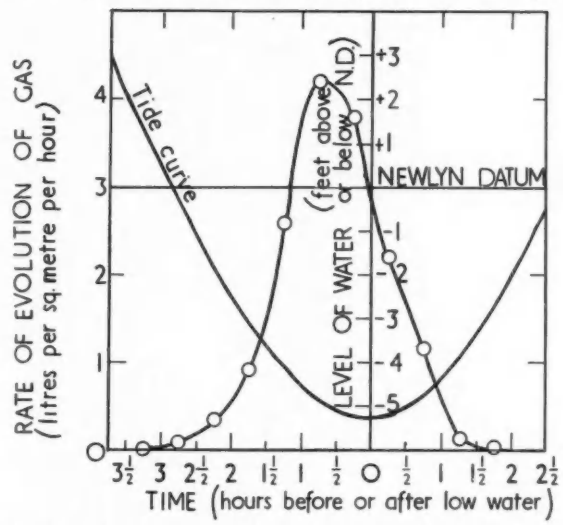


Fig. 1. Rate of release of gas from the bottom deposit in the Tidal Basin at Tilbury during the ebb and flood of a neap tide on 3rd July, 1952.

Research into River Thames Pollution.

During recent years the condition of the estuary has caused concern, particularly during the summer months. Corrosion of ships and fixed structures has occurred in the estuary water, paint exposed near the estuary has been blackened, and foul smells have caused nuisance. Early in the survey it was found that these troubles, which are associated with the presence of sulphide, occurred only when the water was devoid of dissolved oxygen.

The paper which follows is illustrative of the detailed investigation which has been found necessary to build up a picture of the numerous factors contributing to the pollution of the river.

In the reaches of the Thames Estuary where the bottom is covered with mud, gas is released at times, particularly in the summer, and bubbles can be seen breaking the surface of the water. The gas consists largely of methane (Table 1) but contains a proportion of hydrogen sulphide, which causes some complaints of nuisance and corrosion. Most of the hydrogen sulphide dissolves in the water while the bubbles are rising to the surface. The release of the gas may increase deoxygenation of the water by disturbing the deposits, thus bringing into suspension organic particles which have an oxygen demand: also some dissolved oxygen may pass from the water into the rising bubbles and so be removed.

TABLE 1.

Composition of gas rising from mud deposits in the Thames Estuary.

Constituent	Gas rising at entrance to King George V Dock on 30.8.49	Gas rising from submerged bank in Tidal Basin Tilbury 14.9.49	Gas from digestion of mud from the entrance to King George V Dock
	Proportion by volume (per cent)		
Hydrogen sulphide (H_2S)	1.7	0.6	0.9
Carbon dioxide (CO_2)	13.1	10.1	16.4
Methane (CH_4)	75.2	84.0	72.3
Higher paraffins	nil	nil	nil
Oxygen (O_2)	0.8	0.5	0.4
Carbon monoxide (CO)	nil	0.3	0.3
Hydrogen (H_2)	0.5	0.3	1.9
Nitrogen (N_2)	8.7	4.2	7.8

Measurements in the Estuary

During a survey of the Thames Estuary by the Water Pollution Research Laboratory some work was done on the factors which influence the production of gas in the mud. A pyramidal gas collecting hood, one metre square in plan, was suspended in the Tidal Basin at Tilbury so that its apex was just under the surface of the water. A graduated measuring cylinder, full of water, was inverted over an opening in the apex and the volume of gas collected was measured at intervals during the ebb and flood of a neap tide on 3rd July, 1952. The first bubble of gas entered the cylinder 3½ hours before low water. Thereafter the rate of evolution of gas increased, slowly at first, then more rapidly until a maximum rate was achieved about 45 minutes before low water (Fig. 1). The rate fell sharply from 15 minutes before low water, until 75 minutes after low water, by which time gassing had practically ceased. Altogether 7.7 litres of gas were collected: 6.0 litres just before low water, and 1.7 litres immediately after low water.

The rate at which the gas is produced within the deposit depends on the composition of the mud and on bacterial activity which will be affected by the temperature, but is unlikely to be markedly affected by the rise and fall of the tide. That the gas is released

River Thames Pollution—continued

in tidal water only near to the time of low water suggests that the gas, when first formed, is held within the deposit as very small bubbles. During the ebb tide the pressure of water above the deposit decreases; the imprisoned bubbles expand and coalesce, and some of them escape and rise to the surface of the water. After low water, the hydrostatic pressure increases again and bubbles which have not escaped are re-compressed. Since the water level at low tide decreases in the period between neaps and springs, and

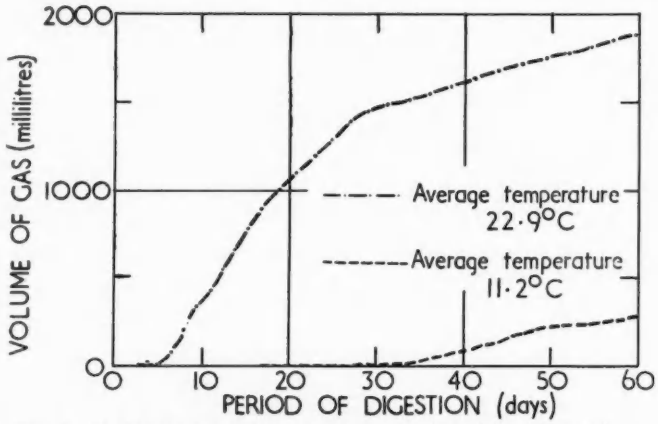


Fig. 2. Evolution of gas from duplicate samples of liquid mud from Gravesend Reach stored in the laboratory at different temperatures.

increases in the period between springs and neaps, a greater volume of gas is released in the week before than in the week after the highest spring tide. Thus in successive weeks of the four-week period from 25th August to 22nd September, 1950, the volumes of gas released per week, per square metre, were 171, 124, 164.5 and 61.5 litres, the first and third values being for weeks when the tide was making.

In May, 1950, when the temperature of the water in the Tidal Basin was between 13° C. and 15° C. the volume of gas collected per square metre rarely exceeded 10 litres per day; in July the water was warmer (19° to 21° C.) and the daily volume varied between 22 and 46 litres per day; in October when the temperature was 12° to 15° C. values ranged from 6.5 to 19 litres per day.

Measurements in the Laboratory

Although no laboratory tests were made under closely controlled temperature conditions, the effect of temperature on the rate of production of gas was confirmed by an experiment in which the production of gas from a 5-litre sample of mud containing about 8 per cent. solids, kept in an unheated room having an average temperature of 11.2° C., was compared with that from a similar sample kept in a heated room having an average temperature of 22.9° C. The warm sample started to produce gas after three days (Fig. 2) and reached a maximum rate of evolution of 85 ml. per day in twelve days; after 30 days the rate dropped to between 10 and 30 ml. per day. The cold sample produced a trace of gas in 17 days. A further 17 days passed, however, before the daily collection exceeded 1.0 ml. and by this time more than 1.5 litres of gas had been collected from the warm sample. These experiments are concerned with the production of total gas, mainly methane. Wheatland[1] has described laboratory experiments which show that the rate of formation of sulphide in mixtures of mud and estuary waters is greatly increased by increases in temperature; he concludes that if other factors are constant the rate of formation of sulphide in the estuary during the summer might be about three times as great as during the winter.

An approximate estimate of the volume of gas which can be held by the bottom deposits was obtained during an investigation into the rate of consolidation of liquid mud. Observations were made of the level of the top of the mud layer in a large glass beaker containing originally 7 litres of liquid mud, of which 11.25 per cent. by weight consisted of solid material. At first the volume of the mud layer decreased rapidly—after 5, 10, 15 and 20 days the mud occupied 3.30, 3.00, 2.92 and 2.84 litres respectively. From the 24th to the 27th day the volume of the mud layer was constant at 2.80 litres, and then gradually increased to 2.99 litres on the 38th day. Gas bubbles could be seen in the mud layer at this stage. For the next ten days the volume of mud remained constant, and an occasional bubble of gas was seen to escape to the surface; at least 0.19 litres of gas were now held by the mud. When slight suction was applied to the top of the beaker a considerable volume of gas was released; this disturbed the mud layer which, however, settled down to a volume of 2.55 litres on the 53rd day. By applying suction about once every ten days to remove occluded gas, the volume of the mud layer was reduced to 2.23 litres after 110 days. By calculation, assuming no loss of solids, the mud now contained 32.3 per cent. solids.

In a further test two similar 7-litre samples of liquid mud were set aside. One of these was not disturbed; suction was applied to the other every few days to remove occluded gas. After the first 12 days the volume of the mud in the undisturbed sample remained almost constant (Fig. 3), whereas that in the other decreased if the gas was removed. At the end of 60 days the two volumes were 2.50 and 2.10 litres. The proportion of trapped gas in the undisturbed sample was 16 per cent. During the test the gas in the mud layer was at a pressure little greater than that of the atmosphere. In the middle reaches of the estuary the surface of the mud layer may be at least 25-ft. below the water surface at low water, and possibly 45-ft. below at high water. Thus, any occluded gas may be at a pressure varying between $1\frac{3}{4}$ and 2½ atmospheres, and on being released and rising to the surface of the water it would expand to about twice the volume it occupied in the deposit. Since the bottom deposit in the estuary is subjected to reduced pressure at each low water it is probable that the volume of occluded gas never reaches the high proportion of 16 per cent. achieved under static conditions in the laboratory. It is probably greatest at the end of a period of neap tides.

Summary

Gas produced from mud deposited in parts of the Thames Estuary consists largely of methane but contains a proportion of hydrogen sulphide.

The maximum production of gas occurs shortly before low water when the hydrostatic pressure above the mud is reduced, particularly when the height of water at low tide is decreasing in the period between neap and spring tides.

The amount of gas produced increases with rising temperature.

In a sample of mud stored undisturbed in the laboratory the proportion of trapped gas reached 16 per cent. by volume but in the Estuary it is not likely that such a high proportion would accumulate.

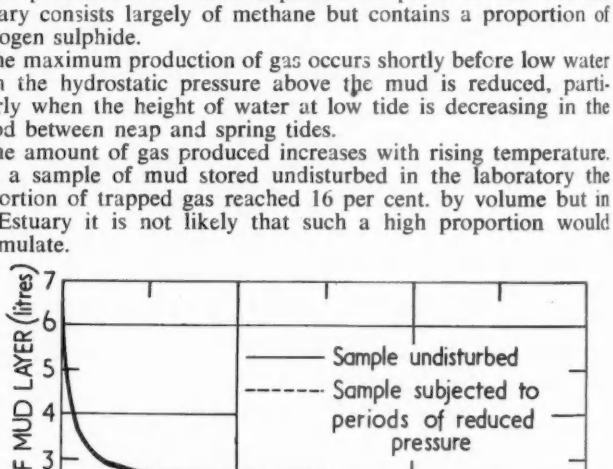


Fig. 3. Effect of formation of gas on the consolidation of a deposit of mud. March to May, 1952.

Acknowledgments

Thanks are due to the Port of London Authority who provided a launch and its crew, and laboratory accommodation and services during the survey of the Thames Estuary.

Messrs. H. Mann, M. J. Barrett, and B. J. Borne of the Water Pollution Research Laboratory made most of the measurements.

REFERENCE

[1] Wheatland, A. B, J. *Hyg., Camb.*, 1954, 52, 194.

"On Research in the Docks Industry"

Being a review of "The Dock Worker", published by the University of Liverpool, Department of Social Science. 1954. (Price 17/6d.)

Another enquiry into the dock industry. One more! This time from the academic world—"The Dock Worker", published for the Department of Social Science by The University of Liverpool. The sub-title announces that it is "an analysis of conditions of employment and industrial relations in the Port of Manchester" during 1950-1951.

The survey has had a good press, in spite of the denigration of some of its investigators by the less responsible newspapers—"Miss Mop listens-in to dockers"—the "fair haired girl", 27 years old, and the "33-year old brunette", who "went to work scrubbing floors at three dockside canteens to listen to what the dockers said."

The industry has become cynical of research workers, and complains that it has had enough of enquiries, governmental and otherwise. Although in this particular enquiry the Manchester Ship Canal Company gave considerable assistance, generally the Employers, the Unions and the National Board do not seem to welcome enquiries, and research workers find access to material difficult. This attitude of the industry is, perhaps, understandable. The industry knows its own business; it knows its own problems. Enquiries by the Government usually tell the industry what it already knows and asks the parties thereafter to resolve the question at issue. Other enquiries cannot do even this. They are undertaken by research workers of varying qualifications without knowledge of the industry and with only limited access to the facts. Knowledge, in the sense of experience, is important in understanding the problems of this industry. There are some eighty ports within the Dock Labour Scheme with more dissimilarities than similarities of social and working conditions. A docker in Tilbury is different in his "attitudes"—to use a Survey term—to, say, a man in the Pool of London; and the London lighterman is different to either; and the North end man differs from one from the South end of Liverpool; and the fish lumper in Fleetwood from one in Grimsby. And within this Report, the foreman's attitude is clearly far removed from that of the docker; so, incidentally, is the attitude of the Manchester Ship Canal personnel from that of an officer of the National Board or the Union or the employers. All of which is very confusing to the outsider.

The reticence of the industry towards these public and semi-public enquiries, though understandable, may, however, be damaging and misleading. False statements may go unchallenged. The public may thus be sadly misinformed about this vital industry. Even those of the public who may be anxious to treat dock matters seriously in the public interest find it difficult to get facts on which to pass opinion. This survey, published five years after the Research was undertaken, is being accepted, by many otherwise well informed people not concerned with docks, as authoritative; but there has been no word of comment or criticism from the industry. Failing any such correcting statement, this enquiry may well be accepted in future as indicative of the causes of the troubles in the industry and descriptive of the current state of affairs, though it deals only with one port where the industrial set-up is different from any other port and relates to conditions existing five years ago, since when some major changes have taken place.

But however that may be, the authors raise points of importance to the industry and to the country.

The survey, for example, gives considerable attention to some aspects of the question of communications; it states that the problem of unofficial strikes in Manchester may not merely have arisen from poor communications . . . but also be due to the absence of "language in which to communicate" and proceeds to argue that this requires "the right formal relationships" between persons on different industrial levels, and translation of informal industrial negotiations into language understood by the rank and file members of the Union.

It is argued throughout that there was considerable ignorance among the men, even as to the elementary fact of the name of their employer; that there was a lack of communication between the men and the Union, and the management; and that quite frequently, misunderstandings arose because of the legalistic aspect of the Scheme as, for example, in the operation of the Appeal Tribunals.

If this is true—and it is an important point—it is difficult to understand. Much more could have been done and should have been done to have explained the Scheme to everybody engaged in it—not only at its inception, but thereafter. Yet surely there is no other industry in which there is a closer and more frequent contact between all engaged in it than in the docks industry. Even the smallest port is so cluttered up with Joint Committees that it is almost impossible to secure a decision without prior consultation.

In most ports there is a Local Joint Council, a Joint Registration Committee, a Local Board of the National Board (also jointly controlled), or a sub-committee thereof; and before disciplinary action can be taken the Local Board must take a decision and thereafter the man may appeal to another joint body, namely, the Appeal Tribunal, or, in the case of an employer, may appeal to the Minister. Where there are special groups of workers, such as trimmers, riggers, fish lumpers, they, too, have their own joint negotiating arrangements. Surely there can be no lack of the means of communication. On the other hand, the succession of strikes, official and unofficial, would seem to indicate that there must be some substance in this comment of the report. May it not be that once a strike is on, all usual channels of communication are closed down except the Branch meetings of the Union, and the mass meeting? But the argument is not confined to strike circumstances; indeed, the lack of communications is stated to be a weakness of the whole industrial structure.

And the meetings of the joint bodies are often very informal and friendly—perhaps too much so sometimes.

The Appeal Tribunal which has authority under the Scheme as the final arbiter in disciplinary matters hears the cases, occasionally with an independent chairman, argued informally rather than formally; indeed, the informality of the Tribunal might be justifiably criticised rather than its legalistic aspect.

Quite apart from the hundreds of Joint Committees, some of very long standing, dealing with the industrial affairs of some 80,000 workers, the report perhaps gives too little weight to the intimate personal relationships that exist in many dock areas between the employer and the dock worker. Owing to the particular nature of the history of Manchester with the dominance of the Manchester Ship Canal, this facet might not be so apparent there as in other ports where the industry has grown up around individuals and well-known shipping and stevedore companies. The "blue eyes" were not necessarily favourites in the derogatory sense, but men accustomed to following a firm and knowing its methods of working; they were the core of a stable labour force in the docks before decasualisation.

These personal relationships are still very strong. Trouble quite frequently occurs among the new men in the industry, employers and workers, who have never known such individual loyalty to a firm or an individual employer; nor do they know how the joint industrial machinery, which was so hardly won and dearly bought by their predecessors, was brought into being.

This is one of the major unresolved problems of the industry. How can this loyalty be invoked among the 80,000 men, now given some security of employment by the Dock Labour Scheme? Is this loyalty to centre round the Board, the employer, the Union, the foreman or what? The report illustrates the confused and conflicting loyalties of today. Each strike has evoked loyalties for which the men have suffered. But they conflict with the good of

"On Research in the Docks Industry"—*continued*

the industry and with the best interest of the nation. Here surely is a tremendous potentiality for the good of all; in fact, because of the confusion within, it is negative and destructive.

The book should be read critically on its basic evidence, especially its interviews with the dock workers, in view of the importance of these and other issues it raises thereupon. There is a very formidable Appendix showing that a fair sample was taken. This may be true in terms of numbers and categories of men, but one has doubts as to the methods of these interviews. The men were not interviewed in the Board's premises, the Union offices or Welfare office—but in the offices of the Manchester Ship Canal Company. It is difficult to imagine a dock worker sitting in a shipping office, giving free expression to his views to someone outside the industry, particularly if that person happens to be a woman unknown to him. Clearly, it is dangerous to base observations affecting the well-being of an industry on random remarks given under these circumstances. This is not to say, however, that some of the deductions made by the research workers are not valid or worthy of comment.

It is assumed that the various quotations and expressions of opinion quoted verbatim and summarised statistically are the basis of some of the opinions of the authors. One sometimes gets the impression that the investigators were overweighting the importance of the men's statements. However fair the sample, if the wrong questions are given and the answers wrongly evaluated, the sample can be completely misleading.

But the comments of the men are lively and sometimes very illuminating. It is noted critically, for example, that the men did not know who was their employer. Of those interviewed, 50% referred to the Manchester Ship Canal as the employer; 35% to the Dock Labour Board; 12% did not know. This would seem an extraordinary state of affairs to somebody not accustomed to the workings of the dock industry. But the answer to this apparently simple question might baffle a lawyer and would depend on the occupation of the particular man at the time of the questioning. On Monday he might be employed by the Manchester Ship Canal; on Tuesday by the Board—using the word "employer" in the Scheme sense; on another day by an entirely different employer—even in Manchester! It is doubtful if the research worker could, offhand, describe the stage at which a man passed from the employment of a registered employer into that of the Board. It may be said that the question was not easy to answer, the men may or may not have been right; but the point is useful in illustrating how difficult it is for a man to find a focal point for his industrial loyalty.

The survey makes only the slightest reference to the fact that a Dock Labour Scheme was introduced in 1941 by the Ministry of Transport. It is almost made to appear that 1947 was the starting date of the Scheme. Many practices and traditions of the wartime scheme operating on the Merseyside, very different from those in other ports in the country, took some time to change, and at least account in part for some of the "attitudes".

Another example of the author's incomplete evidence is the reference to the issue by the Board of a pamphlet explaining the Scheme which is criticised for being written in legal language; in fact, the document was nothing more than a truncated version of the Scheme itself, which is the basis of the individual and legal contract between the man and the Board.

It is also stated the Company calculated and paid the men's wages at the time of the survey; it omits the vitally important point that the Company was merely acting as an accounting agency for the Board.

It is also quite clear that the many expressions of opinion of the investigators—which often give the impression of being personal assumptions and predilictions—about the methods of working, the Board, the Unions and the hierarchy of the Ship Canal would be challenged by each section concerned. But these are precisely the sort of matters which the industry would do well to challenge itself and not allow to go by default; and this should be done, not in an attempt to deride the work of the authors or to whitewash the administration of the industry, but as a contribution to the study of a complex problem. It is not an academic issue that is under discussion in this book, but industrial and social issues, which year after year disrupt the ports, with increasing severity and disastrous effects upon the prosperity of the country. That is the challenge of this report and, in spite of its deficiencies, some issues are clearly stated.

How is it, in an industry in which rates of pay have increased very considerably, a guaranteed week and the weekly pay packet have been instituted, in which joint consultation is almost rampant, that men will follow the upstart unofficial leader who has no authority to negotiate, and will suffer hardship through prolonged strikes usually about anything but money?—There is no wage conflict between employer and worker. The stevedores' strike was between two of the Unions representative of the dockers, with members of *both* Unions supporting the Stevedores' Union, which called the strike. The Canadian Seamen's strike was an American inter-union struggle which had only the remotest connection with dock workers in this country, and yet it brought many British ports to a standstill. It surely cannot be beyond the wit of the industry to resolve this problem or at least take steps to resolve it. Meanwhile, each strike follows the familiar pattern; ships pile up; quays and warehouses are congested; hinterland factories are overstocked with exports or are short of raw import materials; the unofficial leader appears and disappears into the shades of anonymity; the country as a whole endures until the strike is over. Then the industry resumes work with long hours and high pay to all concerned, and picks up the old pattern of living and working without, to the outsider, any sign that it is seriously considering during the "lull" the strike problem with a view to avoiding a recurrence.

And yet, in the last resort, only those in the industry can resolve these problems, though it sometimes would appear that the effort will not be made except under pressure of a Government Enquiry.

The authors rightly point out—and this is a proper contribution of academic research—that the first task is to "identify clearly and precisely the problems that have to be solved"; to "explain why men stay at work rather than strike, for the satisfactions that motivate and establish a habitual course of conduct are obviously more important than the dissatisfactions that motivate temporary deviation from it". Unfortunately, temporary deviations seem more like becoming the rule among half the registered dock labour force.

It is also fully recognised throughout the book that patterns of thinking and social relationships are very important, particularly in the dock industry. Perhaps this would be the proper starting point of any such enquiry into the sad state of affairs in the industry. It is all so contradictory. On the one hand, relationships in the industry are very bad; there is bitterness, intimidation, threats of physical violence, and mob law—during most of the strikes. Yet the strikes are not against one person or a group of persons, say the employers, or the Board, or the Government—though there is a tendency to be "agin" authority. They are not communist, though a few communist names appear during each disturbance. And at the same time, there is a friendliness among the people in the industry, whether on joint committees or on the sports field which would seem to be in stark contradiction to the industrial chaos.

Moreover, for many years past, the Unions have not had to fight to secure substantial improvements in working conditions; claims have been conceded willingly after negotiations—and some of the negotiations would have been less protracted but for the periodic outbursts of strike madness. It would be an ironic conclusion to think that official strikes periodically would be a useful safety valve! One thing is clear: the docks industry is composed in the main of highly individual characters, among employers and men, who like the life because of its element of freedom as compared with factory life, and who by the nature of the work must work as individuals in co-operation—in the gang or in the pontoon.

The analysis of conditions in the Port of Manchester by the authors starting from this point is a pilot study of the present disturbed industrial relations. It may well be that working conditions are a factor—as the authors conclude; certainly the position of the foreman in relation to the control of labour is important and needs

"*On Research in the Docks Industry*"—*continued*

review. In Manchester, it would appear that he does not even take his case to the Appeal Tribunal; in some ports he is almost the star witness; in some, it might be difficult to decide which is the defendant, the foreman or the man. It should be asked if the pendulum has not swung too far since 1940 and that the authority of the foreman has been so undermined as to affect the working relationship with the gang.

There is reference to the legalism of the Tribunals which, the authors suggest with apparent justification, is part of the pseudo-legalistic scheme which negatives discipline by its slow procedure. But even if the procedure was to be improved—as it surely must—the problem of discipline would remain, and the fundamental issue is a moral one of evoking discipline within the men.

These are some of many facets of the strike problem to be studied with great care and with courage and imagination. And the first essential is that the industry should adopt a positive attitude in relation to strikes.

This would mean a change of view on the part of many interests. All would need to adopt a positive attitude to strikes and not leave the initiative to the unofficial crowd. Often has it appeared to the public that the only person with a positive plan, knowing his own mind, and with an audience, is the unofficial leader. It not only appears like that to the public, but to the men—and they follow. How often it seems as though the employers are enduring the strike in pained surprise at the thankless behaviour of the men; and the Board, a Samson Agonistes,

"Eyeless in Gaza at the mill with slaves"

and the Unions fighting a rearguard action against the muscovites.

"Wild cat" strikes cannot be solved by "wild cat" solutions, but even that would be better than each party disclaiming responsibility and leaving only those immediately concerned to fight it out. The solution cannot be found by the Union or Unions alone. It must be found by the industry, including the Board, as a whole.

The survey draws attention to the very considerable economic and social improvements that have taken place since the introduction of the Dock Labour Scheme. There has been an economic and social revolution. The weekly pay packet has not only given "minimal economic security" it has produced a social change at home—there is always a lot of grumbling among dockers when the press publicise dockers' earnings! At the same time, there have been major physical improvements in working conditions, better canteens, new modern lavatories, properly lit places of call-on, and washing facilities—though there are still many old canteens (often very popular with the men) primitive lavatories and a lack of drinking fountains; but there has been very considerable expenditure of money and effort by Port Authorities, Port Employers and the Board. Indeed, the industry has shown itself to be ahead of the Government in this matter in some respects—(it is said that when it sought legislation from the Government in the matter of sanitation some years ago, it was refused).

But as the survey asks, why is it that in view of all these fundamental improvements, industrial relationships are so bad? Is it, as the authors state, because of the confusion in command between the National and Local Boards, the Manchester Ship Canal Company, the Board, the Unions as officials and as members of the Local Board? Is it that large scale organisations cannot deal with the men as men as easily as they can provide buildings, accounting machines and all the paraphernalia of administration?

Now it is perhaps here that the survey based on one port—though with a cross reference occasionally to Liverpool—is weakest in its deductions. The industry has "growed" like Topsy. It has grown around an inlet, an artificial dock maybe, around a certain traffic, sea route, even around a type of ship. It has continually changed as the ships changed and became larger and mechanised, and as traffic changed, and as sea routes changed. But it has been a local industry and still is. Its outlook is seawards; its practice of operation is parochial. Such national industrial structures as have emerged are less than 40 years old, and still the associations of employers and men, bear the signs of the early merging of local organisations into a national association. It was a hard fought merger of the local unions into the Transport and General Workers Union—and it was not complete! The story of the recent stevedores' strike is not without its historical precedent.

On the other hand, the Dock Labour Scheme is essentially based on the idea of a national labour force and national finances; there could be no other economical method of achieving the "minimal security." But it too has its Local Boards with some delegated functions.

There are, it is true, national wage agreements, but these are primarily the basis of many local agreements. There are similar local agreements for each port defining even what is dock work. The methods of working a commodity may vary considerably as was evidenced by the strike over grain handling in Hull.

The difficulties do not arise from large scale organisation in relation to local labour. It may be that the old bottles cannot carry new wine; new bottles may be needed. It may be that a thorough review of the structure of the industry as a whole, including the Scheme, is required so that decisions may be taken fairly and quickly and given with authority. It is certainly necessary to define the persons with whom relationships are supposed to exist—and to what end. The industry has all the means of evoking loyalty—the importance of its work to society, the romance of its trade, its traditions, its union banners and house flags, the interest of the public, good earnings, and a measure of freedom to the worker not generally available in other industries. It may well be that the multitudinous councils are immersing so many in so much detail that action is atrophied.

It should also be asked as to the basis of strikes in terms of persons—not in the usual sense as in the past, namely, that A or B or C were the instigators. Previous enquiries have surely established that such men are made by the strike, but do not cause the strike. In every dock strike, it is known that many good dockers support the struggle because they cannot stand against the mass. Yet the mass is seldom in evidence. The meetings are comparatively small, and if a large meeting is organised, say at the Albert Hall, there will be a minority to wreck it and the good docker goes home in disgust. It is not a question of victimisation, but what is needed is a careful examination of the labour employed and particularly of newcomers. The industry can select its labour now; sometimes it would appear to take the first comers without adequate check. It is known generally that there are still many on the labour strength—young ones amongst them—that the industry could do well without and who, while in the industry, will make the development of loyalty and good relationship very difficult. It is too easy to become a docker; it is too difficult to cease to be a docker. This problem could be solved overnight, if the resolution to do so was in the localities.

These are some of the matters which are thrown into relief by "The Dock Worker"; it is stimulating, sometimes irritating. The first and last chapters are illuminating; the other chapters detailing the results of the investigation should be accepted as presenting some evidence, incomplete and prejudiced as it may be, (as is admitted by the authors) as a contribution to an assessment of the set-up of the industry in modern conditions against the background of the welfare state and after more than 10 years working of the Dock Labour Scheme.

British Prefabricated Buildings.

Following a series of meetings held during recent months, a number of leading firms in the prefabricated building industry have formed a group to be known as the British Prefabricated Building Industry Group, with premises at 15, Upper Grosvenor Street, London, W.1.

The principal objects of the group are to establish a representative body of the industry, and to stress the advantages of prefabricated building. The group has no commercial or sales function but is to act in an advisory capacity for the industry as a whole. The affairs of the group are to be conducted by an Executive Committee consisting of four members who will be elected annually.

Helical Flow in Open Channel Bends

Factor in Meandering Phenomena

By T. M. PRUS-CHACINSKI, A.M.I.C.E.

The following remarks report in outline some of the more important results of an investigation carried out in the Hawksley Hydraulic Laboratory at the City and Guilds College by the author under the guidance of Professor C. M. White, D.Sc., into the three dimensional flow patterns of water in river bends.

Along a curved channel water tends always to follow a helical path, the flow near the bed being deflected towards the inner wall while the upper water drifts gradually towards the outer wall. This phenomenon, observed by Leonardo da Vinci in the XV century, was first investigated scientifically by Professor J. Thomson in this country who in 1876 gave a substantially correct explanation of the origin of the helical flow and also indicated its significance in the erosion phenomena of natural rivers. Since then the subject has never ceased to occupy engineers and research workers, but due to the difficulties of measurements and even greater difficulties in mathematical expression, very little further progress was achieved until recently, despite the practical significance of the phenomenon concerning as it does the fundamentals of the transport of silt and meandering of rivers, a field of the greatest interest in river control and irrigation.

John R. Freeman, prominent American Hydraulic Engineer, compiled in the nineteen twenties a list of problems in hydraulics awaiting solution. Characteristically he put "the spiral flow in bends," first on the list.

Essentially helical or spiral flow in a bend is generated by the centrifugal superelevation of the water surface towards the outer wall in conjunction with friction which greatly decelerates water flowing very near the bed. Centrifugal force, proportional to the square of the velocity, causes the fast upper-water to heap up against the outer wall, and the resulting pressure squeezes the slow-moving lower-water towards the inner wall. In effect, the path of the water is a screw or helix of non-uniform pitch, and in general the magnitude of the difference of speeds of upper and lower water governs the strength of the resulting helical component of the motion.

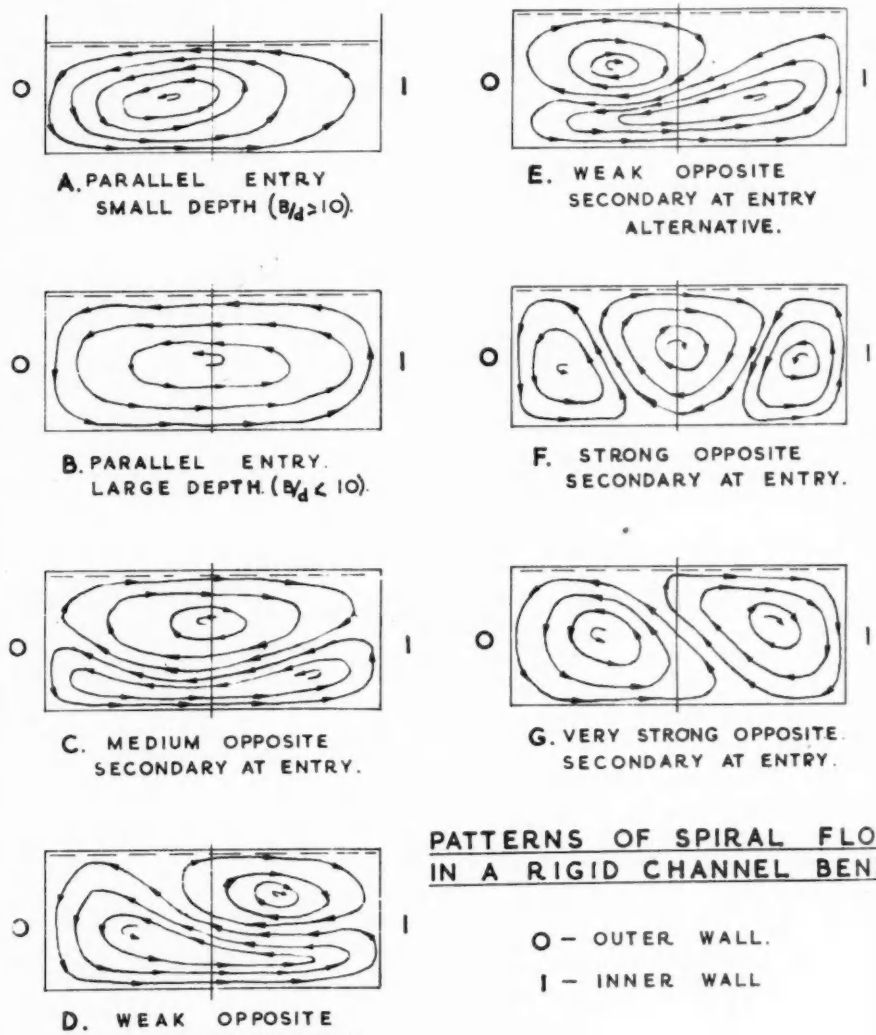
In a silt-carrying channel there is little opportunity to study the complex helical motion which is rendered even more complex by the presence of silt, obscuring the natural action of the bend.

There is no fundamental difference between the flow of a fluid over a solid bed and the flow of the same fluid over a loose bed of sand, though the latter seldom remains constant during a long experiment.

An investigation of helical flow in rigid channels therefore can throw much light on the problem in general and can help in assessing its significance in river mechanics and accordingly a long series of investigations has been and is being carried out at the Hawksley Hydraulic Laboratory at the City and Guilds College under the guidance of Professor White. In this work, experiments with sand beds provide in the first place a general picture of the overall result; the causes are then elucidated by experiments with solid beds, while finally the conclusions are verified by further experiments with sand. Work by the author is one of the links in this chain of investigations.

Among the more interesting findings, some possibly never previously described, or indeed observed, are:—

1. The helical component, once it has developed, dissipates very slowly and so persists for great distances.
2. The helical pattern is very sensitive to the presence of any cross-currents which may happen to exist at the entrance to the channel.
3. The helix causes great variation in the rate of transport of silt in different parts of the bend, and governs the pattern of erosion and deposition.
4. Helical motion occurs with rough and with smooth beds, in very wide and in very narrow channels, and in bends of cross-section other than rectangular.
5. Patterns consisting of multiple helices are frequent.
6. Helical flow can be controlled artificially by vanes or other devices.
7. Motions of the present kind are intimately connected with the meandering of natural rivers.



PATTERNS OF SPIRAL FLOW IN A RIGID CHANNEL BEND.

O — OUTER WALL.

I — INNER WALL

Among the findings listed above one seems to be of fundamental significance, namely that the motion in a bend turns out to be very sensitive to any cross-currents or irregularities which may exist in the water before it enters the bend. It is possible, therefore, by introducing an artificial helical flow at entry to change in a drastic manner the pattern of helical flow in the bend. If opposite bends are connected in series, the character of motion in the upstream bend

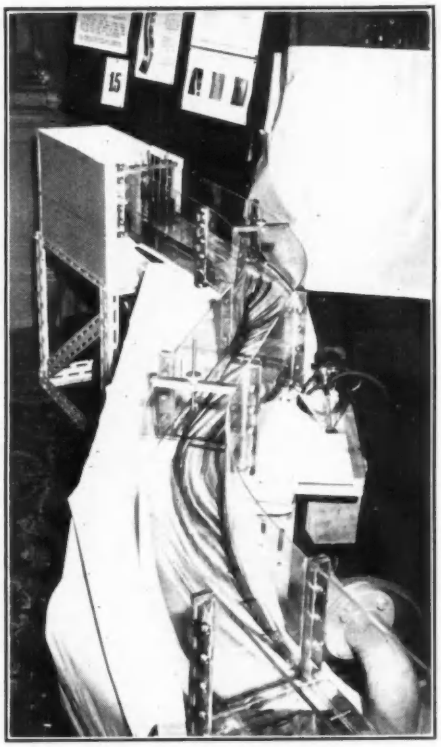
Helical Flow in Open Channel Bends—continued

governs the helical motion in the downstream bend. In fact the number of possible patterns of helical flow is almost infinite.

In its bearing on civil engineering the aim of the present investigation is to guide the design of works adjacent to the bends of rivers and canals, particularly those which carry much silt or whose beds are liable to scour. While at the present stage of the work it would be premature to describe its application to particular river works, it is evident now that there is a wide field in which it could have a considerable influence on design.

Thanks to the work of Gerald Lacey, Sir Claude Inglis and many others, no doubt exists that the behaviour of canals and of natural rivers is describable by certain empirical but physically sound formulae.

So far the phenomenon of helical motion has not been incorporated into the above formulae. However, it may be observed that, while the geometry of a rigid channel is an independent factor, the geometry of a loose boundary is usually a function of the discharge and of the charge. Charge in this connection is the ratio of the total load of material carried by a channel to the discharge. So in loose boundary channels the helical flow may possibly also depend on the discharge and on the charge. Obviously entry conditions are included in the above definition, but now the point of entry is not fixed. It travels with the changing patterns of geometry, i.e. meandering patterns until, if ever, a balance is achieved which would be the so-called "regime" condition. Helical flow causes non-uniform erosion and it emerges as one of the principal factors in river mechanics and particularly in meandering phenomena. Certainly as far as can be predicted, the strength of



helical flow in a large river would be small. Nevertheless, because of the delicacy of the balance between the deposition and erosion, the resulting pattern could be greatly changed by a helical flow, even of small strength. Thus it seems that, by controlling the helical flow, which is within the realms of practical engineering, partial control is possible of the rate and place of erosion and deposition. This offers a real hope of controlling the meander pattern.

It seems the results of the above investigation give strong support to the theory that helical flow is responsible for the initiation of meandering. Indeed it is clear that any slight assymetry in bed movement will introduce a small curvature of flow at some region. This acts as a "trigger" mechanism starting the first bend with differential erosion leading to further development of meandering. In nature, a perfectly symmetrical flow could hardly occur so it follows that natural channels must eventually meander.

A visual demonstration of helical flow has been made by the Hawksley Hydraulic Laboratory and by the author during the Conversazione at the Institution of Civil Engineers on 23rd June. The photograph shows the demonstrated channel which comprised of two bends connected by a straight section and which was executed in perspex. The black lines visible on the bed are the traces of black dye indicating the direction of helical motion on the bed. The sketch shows some frequent patterns of helical motion observed by the author. Some of the observations are so new that time must elapse before their practical significance may be fully realised.

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Discharge of Iron Ore Cargoes

Research Association's Report

In the annual report for 1954 published recently by the British Iron and Steel Research Association, it was stated *inter alia* that investigation is now in progress into the methods of improving the discharge of iron ore, and especially from general cargo carriers. The discharge of ore from new ore carriers has been observed, wherever possible to ensure that the features found to be desirable and undesirable are known when further new ore carriers are built.

A large proportion of the ore imported has still to be brought in general cargo ships, and to remove the last 20 per cent. of the ore requires considerable time and labour. Existing machines for mechanising trimming are being studied.

A new design employing a backhoe, which scrapes ore on to a conveyor belt, carried by a straddle carrier, has been patented, but its development is being deferred in view of the apparent success of a new design of overhead bucket-loader which has recently become available.

The slushing technique employed abroad will shortly be tested at an ore port. With this method, large cable-drawn blades are used to move the ore to the centre of the hold, but appropriate fittings have to be installed in the ship.

It is estimated that more than 12 million tons of iron and manganese ore were imported into the United Kingdom during 1954. This material was unloaded from ships, and, together with large quantities of home ores, was handled again at stockyards by mechanical grabs. Although mechanical grabs have been used for many years, a recent survey has shown that greater efficiency might be obtained by better design. Investigations into the mechanical properties of granular materials, together with theoretical studies of grab action and studies with model grabs, were begun about a year ago, and are being continued in co-operation with grab manufacturers.

The penetration of a blade into graded iron ore mixed to give specific size distributions, under forces applied at various angles, is being studied.

For clam shell and single-pivot wide span grabs, which are two of the three main types used in this country for handling iron ore, theoretical expressions have been obtained showing the variation of the purchase and the resulting digging force as the grab closes. From these equations the various types of grabs can be directly compared and a relation can be found between the forces exerted by a grab and the properties of the material handled.

Experiments are being carried out with model grabs to determine the influence of the various characteristics of a grab on its efficiency. The model grabs used have been specially designed to allow the following features to be varied: (i) Height, span, width, and proportions of the grab; (ii) Purchase, defined as the ratio of the horizontal component of the force at the jaw to the force in the closing ropes; (iii) Weight and weight distribution; (iv) Jaw shape and type of jaw edge.

To compare the results of the theoretical and small-scale studies with what happens in practice, a 30-ton rope tension recorder is being developed to record continuously the variations in the tension in the closing rope of a full-scale grab during the grabbing cycle.

The Future of Cross-Channel Cargo Services

Need for More Mechanisation and Specialised Tonnage

The future of the cross-channel cargo services operated by the British Transport Commission, and the specialised type of tonnage which would be required, were the subject of an address given recently to the London Freight Club by Mr. J. L. Harrington, chief officer (Marine and Administration).

The British Transport Commission's sea-going fleet is based on 14 ports in Great Britain. Of the ships, there are 31 cross-channel cargo vessels and 34 passenger ships, all of which are capable of conveying some cargo. In addition, there are, at present, 11 ships on charter to the Commission. In the course of a year, more than 1¼ million tons of cargo, over 300,000 head of livestock, and nearly 200,000 vehicles are conveyed.

Mr. Harrington said that in general, the commission's shipping services were attracting the better grade traffics, including perishables. The bulk cargoes were often carried by tramps or by lines usually based on the larger ports, and the commission's shipping business occupied an intermediate position between that bulk trade and that which went by air. It was firmly believed that if the shore and shipping facilities kept abreast of modern techniques, there was an assured future for that type of specialised service.

Development of Ferries.

The problem is basically the same for all British owners. Compared with pre-war, shipbuilding costs are at least four times greater, seafarers' wages are about three times as much, and oil bunkers around four times. Port costs have also increased. The burden of replacement and port costs probably falls more heavily on the commission than on shipowners generally. The vessels are on short passages, and it is doubtful if the ships of any other British owner can total the same number of port entries and clearances in any one year. Freight rates have not kept in step with costs; the increase in charges lags behind.

The outstanding advance between the wars was the development of the train ferry services via Harwich-Zeebrugge and Dover-Dunkerque. At the present time, excluding the Humber services, the larger part of British Railways' Continental freight traffic was carried by those ferries. They enabled wagons to work through between the U.K. and all the countries in Western Europe, includ- those within the fringes of the "Iron Curtain." The lastest development had been the introduction of wagons with interchangeable axles to work over the broad-gauge lines in Spain and Portugal.

Mr. Harrington went on to say that to the ordinary shipowner, the economics of ferry operation might appear a little doubtful. The vessels were able to carry only some 35 to 40 railway wagons, and expensive port installations were necessary to allow loading and disharge at all states of the tide. Port handling costs were, however, much reduced, and the ships could, if traffic warranted, make a quick turn-round; if required, two or more complete and separate crews were rostered for each vessel. A worth-while service was given for the specialised and better grade traffics, and Customs' clearance could be undertaken at the London goods depots. The faith of the Transport Commission in those train-ferry services was evidenced by the recent order for a new vessel for the Harwich-Zeebrugge route.

"Admittedly, the train-ferries do not meet all the requirements of the Continental trade, nor could they be usefully introduced on to the Irish and Channel Islands' trades," he continued. "At the present time, we are closely studying the design of ships for routes other than those covered by the train-ferries and the kind of service which will be required in the future."

Mr. Harrington emphasised that it was unwise to look at the ship in isolation, when seeking a solution. Cross-channel shipping, whether owned by the commission or by other undertakings, was for the most part one link in a throughout transit, and future shipbuilding orders must be related to developments ashore and to modern freight handling practice.

Growth of Container Traffic and Palletisation.

The growth of container traffic might be cited in that connection; the number of railway containers shipped abroad last year from Britain to the Continent showed a 50 per cent. increase on the 1950 figure. The cargo ships owned by the commission were among the fastest vessels of their type—some steamed at 17 knots. The majority of them were of pre-war construction and were designed to carry loose and packaged cargo and also livestock. Their high speed was specified to meet the particular requirements of the trades they were intended to serve, and economical considerations demanded a hull form with relatively fine lines.

These pre-war ships, with their wasteful and awkward stowage, were not the best for container traffic. In the future, the aim should be the construction of ships specially designed for the conveyance of such traffic. A ship with engines aft and stowage for containers in two holds and in the 'tween deck is envisaged. Modern techniques can ensure hold spaces with a minimum of obstruction and large hatchways with mechanically-operated folding covers; possibly, a system of rollers could be installed in the holds to facilitate rapid stowage. The shore installations—cranes and quay layout—must necessarily match the ship, but it may not be too optimistic to call for a turn-round in port of four hours, during which time a full load of, say, 60 containers should be discharged and an equal number loaded.

Another modern technique of cargo handling was palletisation. In that connection, it was, of course, impossible to overlook the revolution in cargo handling methods introduced by Mr. Emil Olsen into the services of the United Steamship Company in the Baltic. It was a most impressive achievement, but they had the advantage of almost tideless waters in which to operate, and that greatly facilitated the transfer of pallets from shore to ship. In the cross-channel services based on Britain, the commission's ships, in many places, berthed at what were virtually open sea berths, with tidal ranges in port of up to 40-ft.

Nevertheless, a ship designed primarily for containers would be a good ship for most kinds of cargo, including that on pallets, and there is a possibility of using fork-lift trucks on the shore and in the ship for the loading, discharge and stowage of pallets in conjunction with an installation of lifts on board and at those quaysides where the range of tide is substantial.

Future of Road Transport.

In conclusion, Mr. Harrington dealt with the future of road transport in relation to cross-channel services. The majority of cross-channel services had been built up on the basis that the consignments were brought to the port by railway or road vehicles, and the cargo was taken off the vehicles for shipment. He had made reference to the substantial volume of traffic to and from the Continent by train ferry: would there not be also a corresponding demand for the through conveyance of road vehicles?

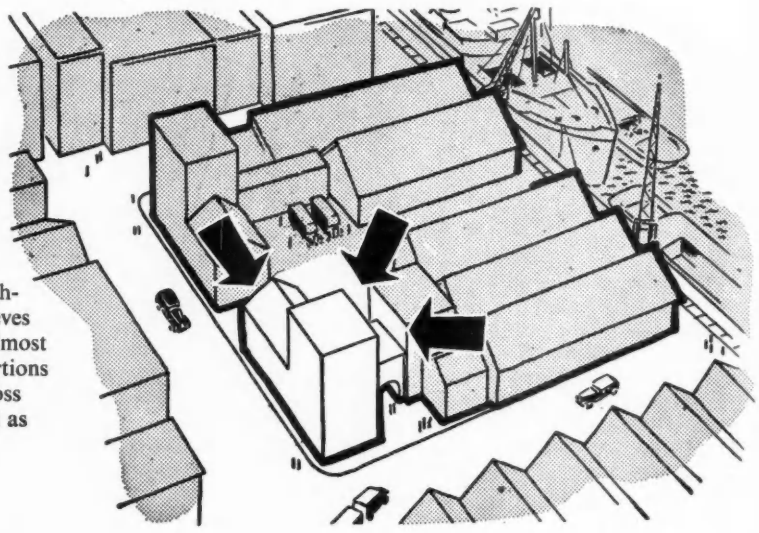
There were indications that the obstacles to the operation of foreign-owned commercial vehicles in Great Britain, and vice versa, might be overcome, and that there might be a call for the throughout conveyance of certain traffic in road vehicles by ferry vessels. It was a question which must receive careful study in the months ahead. First, from the economic aspect, it would be necessary to determine how far the requirements would be met by road vehicles taking containers to the port, and there transferring the containers to a cross-channel vessel. Obviously, from the point of view of stowage, that was the least wasteful method. Secondly, it would be necessary to consider, with all the interests concerned, how a road ferry service would best fit into the present pattern of cross-channel services.

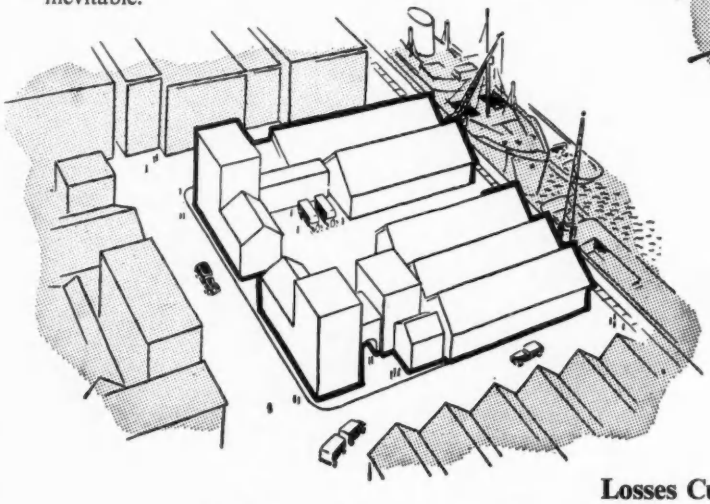
From the practical aspect of ship operation, there seemed few problems. Terminals for road ferry services did not present great constructional difficulties. The vessels at present operating to Northern Ireland were converted war-time L.S.T.'s and were relatively costly to maintain and operate. The commission had recently authorised the construction of a new vessel of about 2,600 tons for the conveyance of commercial road vehicles; the design had been based, in part, on their latest ferry for car and motor coach traffic, and also on the experience gained with the L.S.T.'s. The new ship was primarily intended for the traffic to Northern Ireland, but she might well serve as a model for other cross-channel routes.

Cut that 10% food loss

OUT of every import shipment of grain and foodstuffs, it is estimated that 10% is consumed or contaminated by rats, grain weevils, flour beetles and other pests. To this loss must be added the structural damage and injury to prestige caused by these pests. A large part of the loss occurs in waterside warehouses and mills, which are specially attractive to pests, more of which may arrive with every ship load.

Prudent warehouse keepers recognise the value of timely disinfestation action, which is all the more effective if co-ordinated with similar action by their neighbours. Isolated action by individual warehouses achieves only temporary success. Re-infestation can take place almost immediately from infested buildings in the shaded portions (see drawing on the right). Consequently, the heavy loss consistently caused by pests is quite wrongly regarded as inevitable.





The 'BLOCK CONTROL' Plan

The Disinfestation 'Block Control' Plan is the most effective way of tackling this major problem. Under this plan, experts from the Disinfestation Service make a careful survey of a group of warehouses, stores, mills and adjoining buildings. They identify the pests involved and act promptly, controlling them in all these premises simultaneously (see drawing on the left). This is followed up by a system of thorough inspections, with a particular eye to new outbreaks, and any further action necessary is taken at regular intervals.

Losses Cut

Under Block Control—the bogey of the nearby infested building is eliminated, re-infestation is guarded against and effective control of pests is obtained in whole blocks of warehouses at the same time. Losses are slashed right down, prestige is raised and the small cost involved is saved many times over. *For full information about the Disinfestation 'Block Control' Plan, write to: Disinfestation Ltd., 125 Pall Mall, London, S.W.1, or telephone TRAfalgar 7621.*

The DISINFESTATION Service

HEAD OFFICE & LABORATORIES: FELCOURT, EAST GRINSTEAD, SUSSEX

BRANCHES IN EVERY COUNTY

Suez Canal Improvements

The Eighth Programme*

AT a meeting held on December 7th, 1954, the Administrative Council of the Suez Canal Company decided to put in hand the first stage of improvement works on the Canal, which forms a part of the new programme submitted to the Consultative Works Committee in November, 1954, and which has been formally recommended.

Before explaining the reasons compelling the Company to undertake works of such considerable importance when the concession has only 14 years to run, and before describing the nature of these works, it may be useful to review the present state of the Canal as a result of the last improvement programme and to refer briefly to the growth of traffic, whose increase has been consistent for some years.

Towards the end of 1948, the Suez Canal Company had decided to put in hand a very important programme of improvement works; this programme, the seventh undertaken since the Canal was inaugurated, began in 1949 and has now practically been completed. The following considerations justified these works:

(1) The daily number of ships in transit, which had progressively increased to 17 in 1938, had grown rapidly after the end of the second world war, and had already exceeded 25 by the end of 1948, with an indication that it would continue to grow at the same high rate.

This state of affairs imposed profound changes in transit organisation. It was no longer a question of continuing the existing practice of working isolated vessels through a canal where they could not pass one another. Considerable loss of time resulted from mooring so that ships could pass, with the risk of slowing down navigation to an unwarrantable extent, since the number of moorings increased much more rapidly than the number of ships. It therefore became essential to organise navigation in convoys with fixed passing places. But, Port Said was not equipped for the arrival and departure of convoys of ships whose number was increasing.

(2) The number of tankers loaded with crude oil or petrol greatly increased during the decade 1938-48, the daily average increasing from 1 to 4. The passage of these vessels demands the greatest care because of the very low flash point of crude oil. Even a slight shock or a small spark can cause an explosion or outbreak of fire having very serious consequences.

It was therefore not possible to allow a large number of such dangerous ships to pass one another in the Canal without running an excessive risk.

(3) The draft of large tankers continued to increase and certain tankers under construction in 1948 were designed to draw 35-ft., more than the permitted Canal maximum of 34-ft.

The seventh improvement programme comprised the following main works:

(1) Enlargement of the harbour of Port Said to permit a considerable movement of ships during the arrival and departure of convoys.

(2) The creation of a by-pass at Ballah, between kilometres 50 and 62, in order to avoid ships passing one another in the narrow cut of the Canal.

(3) General deepening of the Canal by about 50 cm. in order to allow the passage of ships drawing 36-ft.

Today these works are practically complete. The harbour of Port Said has at its disposal an adequate number of mooring berths for the use of ships having to stop there for commercial reasons, or to wait there for the departure of a convoy.

All vessels in transit from the south, including almost all loaded tankers, make use of the Ballah by-pass, which, at the north end of the Canal Zone, forms a pair to the natural passing place which is formed at the south end by the Great Bitter Lake.

With regard to the increase of draft, the objective sought has only been partially attained, since the maximum draft authorized cannot exceed 35-ft. It is almost certain that the works carried out during the seventh programme will not permit the authorized maximum draft to be 36-ft. Later we shall explain the reason for this.

The traffic handled during 1948 showed an increase over 1938 of 40 per cent. in the number of transits and of 60 per cent. in tonnage; from 1938 to 1954 the number of transits has more than doubled and tonnage has increased nearly threefold. The following table shows this rapid increase, due mainly to the development of oil shipments, chiefly of crude oil from the Middle East.

Year	No. of Ships Per Annum	No. of Ships Per Day	No. of Tankers Loaded Per Day	Net Tonnage Per Annum (1,000's of Tons)	Cargo (1,000's of Tons) Total	Cargo (1,000's of Tons) Crude Oil and Petrol
1910	4,533	12.4	—	16,582	22,435	92(1)
1938	6,171	16.9	1	34,418	28,779	2,067(1)
1948	8,686	23.7	4	55,081	49,369	17,612(1)
1951	11,694	32.0	6.9	80,356	76,753	37,516
1954	13,215	36.2	9.0	102,494	96,881	56,351

(1) Approximate figures relating to traffic moving north only, amount of traffic moving south being negligible.

The question arising from the above facts is: what will the traffic be in the near future?

The Company is, of course, concerned with the future development of traffic. Information supplied by various oil companies compels the Canal Company to expect within a very few years an oil traffic of 90 to 100 million tons. Rapid calculation shows that these figures correspond to the transit of 45 tankers per day, after taking into account the trend towards increased tanker capacity.

This increased traffic cannot but influence the operating conditions of the Canal. It is to be feared that the Suez Canal, as it is now, will approach the limit of its capacity in the very near future. Detailed investigations, undertaken two years ago, proved that as soon as the works in the seventh programme had been completed, the maximum capacity of the Canal could not, under the most favourable conditions, exceed an average of more than forty ships daily. The daily average during last April was 39.2 ships.

Continuous development of traffic, although not of immediate concern, nevertheless presents a problem of adaptation demanding a quick solution, if the passage of all vessels under all conditions is to be ensured. The sharp increase of traffic has had an influence on the condition of the underwater slopes of the Canal. For some years there has been considerable erosion; the top of the banks and the berms at the stone facings have been eroded to an alarming extent, accompanied by rapid silting of the Canal bed. Since 1947 much more extensive dredging has therefore been necessary than was formerly the case, resulting in increased maintenance costs.

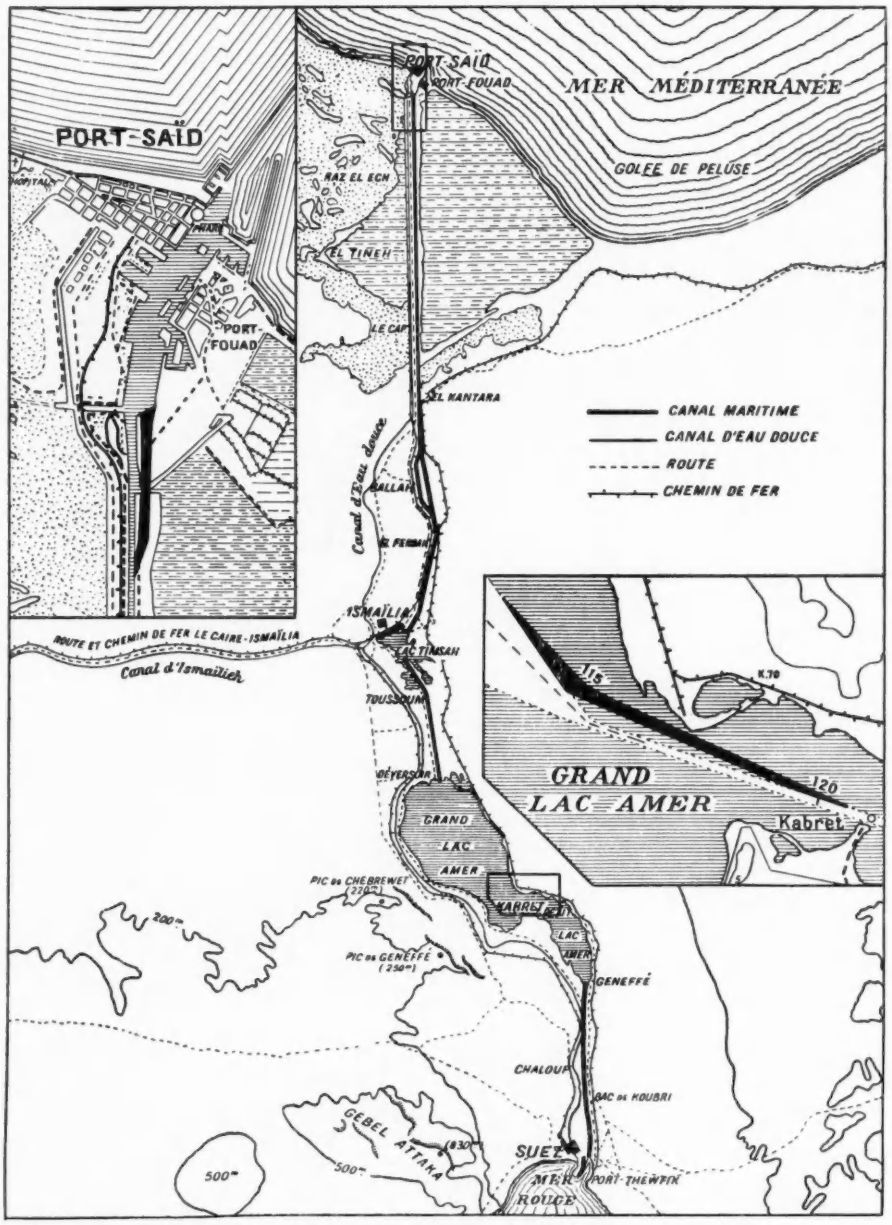
On the other hand, it has become absolutely essential to reduce slightly the speed of ships passing through the Canal, as this is a matter of the utmost importance. In the northern section of the Canal, in particular where the soil is very mobile, the banks and berms are so eroded that the stone facing, undercut by more than two metres, has been threatening to cave in over great lengths, carrying with it the road which skirts the Canal on the African bank.

In order to restrain erosion, the speed of ships has been strictly limited to 14 kilometres per hour for ships travelling southwards and to 13 kilometres per hour for heavily laden ships going northwards. Model tests carried out in Grenoble to a scale of one twenty-fifth full size during 1952-54 showed the importance of reduced speed. A scale model ship 8 metres long was towed over a length of a model canal 80 metres long and 6 metres wide, laid out in sand. It was shown that erosion was very much greater at a speed of 14 kilometres an hour than it was at 13 kilometres an hour (13 km/h=8 knots).

In practice it has been found that the reduced speed of 13 kilometres an hour, which was introduced a few months ago for heavily laden ships, has resulted in greatly reduced erosion. But this reduced speed reduces the maximum number of vessels which can pass through the Canal every day.

* Compiled from a supplement to the "Suez Canal Bulletin". Translated from the French.

Suez Canal Improvements—continued



The Suez Canal: Proposed improvements at Port Said and at Kabret are shown in black in the insets.

The basic need for the eighth improvement programme is founded on the following requirements. The maximum capacity of the Canal under present conditions is an average of 40 ships daily; actual traffic in November, 1954, amounted to 38 ships daily. It is also to be expected that in a few years the average traffic will be 45 ships daily, and that the speed of large heavily laden vessels cannot exceed 13 kilometres per hour through the Canal itself.

Furthermore, most ships with more than 35-ft. draft could not sail at convoy speed either because excessive erosion would occur at the banks or because they would have insufficient power to overcome the resistance of the water in a channel too narrow for their speed.

The problem to be solved was to ensure the passage of between 45 and 50 ships per day, and to enable large tankers drawing 36-ft. of water to proceed at normal speed without causing excessive erosion. The Suez Canal Company, as operators of a public international service, has always considered that it is essential in all circumstances to guarantee the passage of all normal ships; it owes a duty to its world wide clientèle to find a rapid solution to this problem, and to carry out the necessary work.

The first and obvious solution is to increase the speed of ships, thereby ensuring that a large number will pass through the Canal; but their speed cannot be increased because of the resulting damage to the banks. Another solution would be to increase the size of convoys by taking 15 ships through at a time instead of 10, in which case the capacity of the Canal will be increased by 50 per cent.

However, for navigational safety it is necessary that the minimum spacing between ships should be as follows:

Ordinary ships	5 minutes,	or about		1,100	metres
Small tankers	10	„	„	2,200	„
Large tankers	15	„	„	3,300	„

It can readily be appreciated that it is difficult enough, on the one hand, to form a convoy in close order at Port Said, which is a very long port, and on the other hand to maintain the regulation distance between ships during passage in convoy. However, thanks to radio communication, it is possible to improve the formation of convoys and to ensure correct spacing between ships in transit. Today at Port Said, all pilot boats and tugs are provided with radio equipment. In a relatively short time, all Canal pilots will be provided with light radio sets enabling them to communicate with each other during passage of ships.

Meanwhile, in spite of everything, the formation of close convoys in Port Said remains difficult; the port comprises a number of basins spread out over 5 kilometres, in which the ships are either secured longitudinally at moorings or transversely at anchor. A ship with about 90 metres of anchor cable out has to be allowed at least a quarter of an hour for manœuvring, particularly if she has to employ a tug.

Moreover, and this is an important point, ships destined for Suez cannot begin their mooring manœuvres until the convoy arriving from the south has either left the port or has completed its berthing operations.

It is clear that considerable time is lost between the arrival of a convoy coming from the Canal to Port Said and the departure of another convoy from Port Said for the south. In order to avoid this loss of time and improve the formation of convoys leaving Port Said, it is hoped to build a lateral canal several kilometres long parallel to the maritime canal and south of the port, in which most of the ships would take up their positions one behind the other before entering the Canal. Immediately upon arrival of the convoy from the south, the convoy in formation would be able to move off in close formation. It would thus be possible to increase considerably the number of ships in convoys leaving Port Said. The construction of the lateral canal, to be known as the Port Said By-pass, will bring another advantage, in that the northern section of the Canal will be shortened.

Twice daily convoys leave both ends of the Canal at certain times and pass each other at the passing places, which are spaced one-third and two-thirds of the Canal's length, one at Ballah by-pass and the other in the Great Bitter Lake. The space between the sections are, in fact, not quite equal, being as follows:

(a) *North Section.* Port said to beginning of Ballah by-pass 50 km.

(b) *Middle Section.* End of

Suez Canal Improvements—continued

Part of the Anchorage at Suez.

Ballah by-pass to north part of Great Bitter Lake ... 42 km.

(c) *South Section.* South of Great Bitter Lake to Port Thewfik 47 km.

The longest of the three is the north section. Now, the Canal's capacity is in proportion to time taken to traverse the longest section. The advantage in curtailing this section is, therefore, obvious. Curtailing the north section from 50 to 45 kilometres would allow the passage of three or four more ships every 24 hours.

The full advantage of Port Said would, however, only be obtained if another by-pass was constructed at the exit of the Canal into the south part of the Great Bitter Lake.

Advantages similar to those of the Port Said by-pass would be derived from this construction, known as the Kabret by-pass, namely:

(1) Anchorage in the south of the Great Bitter Lake would be eliminated. Because of the prevailing north-westerly winds, a vessel anchored in the Great Lake always heads north and must "swing" or, in other words, describe an arc in order to move into the south section.

(2) The length of the south section would be reduced from 47 to 44 km.

The south section can, in fact, be slightly longer than the other two, as it includes the intersection in the Little Bitter Lake, in which speeds up to 16 kilometres per hour can be reached without danger. One problem, however, renders its curtailment imperative. It is generally known that the Red Sea, unlike the Mediterranean, is subject to appreciable tides, reaching 2 metres at Suez. The effect of these tides can be felt as far as the Bitter Lakes and results in an alternate ebb and flow current of equal intensity of from 1 to 2 metres a second. Large vessels cannot travel against the stream in the south section at more than 11 kilometres per hour for a distance of 30 kilometres.

The corresponding loss of time is generally made good by time gained by the convoy going in the other direction with the current. Twice a month, however, because of the tide rhythm, both the convoy from the north and that from the south have a head current. Conditions during this period are the same as if the south section's length had been increased from 4 to 5 kilometres.

Features of the Port Said By-Pass.

The Port Said By-pass will consist of a cut 2.3 kilometres long and nearly parallel to the main Canal. It will have a guaranteed depth of 12.5 metres and is being dredged to 14 metres. At 11 metres depth, its breadth will vary from 75 to 100 metres. At the north end it will flow into the Hussein Basin, of which it will be an extension, and to the south it will join the maritime canal at 6 kilometres. This intersection will necessitate excavation of 7,400,000 cubic metres of spoil. The by-pass can be completed in 19 months and should be in use at the end of 1956. Twelve mooring berths are provided for, five in the by-pass itself and seven in the Hussein Basin.

Features of the Kabret By-Pass.

The Kabret By-pass will be entirely a dredged channel 3.7 km. long and dug out of the southern part of the Great Bitter Lake, parallel to the Maritime Canal. It will have a guaranteed depth of 12 metres, dredging being carried down to 13.5 metres, and its width at 11 metres depth will be 90 metres. To the north it will flow into the Great Lake anchorage berth, and at the south end it will meet the Maritime Canal at 118.50 km. in the vicinity of the Kabret Signal Station. This will involve the dredging of 4,800,000 cubic metres of spoil, which can be completed in 11 months.

After construction of these two by-passes, the average daily capacity of the Canal can be increased from 40 to 48 ships, rising, exceptionally, to 60 ships per 24 hours.

This construction, while coping with traffic increase, does not facilitate the transit of large vessels, the proportion of which increases annually.

Research Into the Behaviour of Ships Drawing 36-ft.

The transit of very large ships of deep draft in a narrow canal poses two problems.

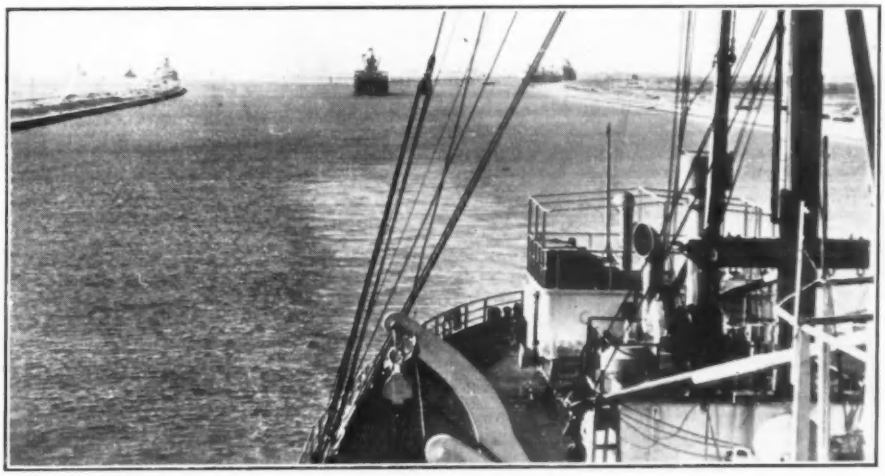
First, large vessels cause severe erosion to the canal banks, so that their speed is perforce limited. The limit depends on the relative dimensions of ship and canal. As the Canal stands at present, ships drawing 34—35-ft. may move at 13 km. per hour, but no longer at 14 km. per hour.

Second, very much more power is required in the Canal than in the open sea to achieve the same speed; this increase of power is often beyond the capacity of a ship's engines.

In order to obtain a forecast of the behaviour of tankers drawing 36-ft. in the Canal, the Company arranged for the Dauphinois Hydraulic Laboratory at Grenoble (the Neyrpic Institute) to carry out a series of trials on a reduced scale. The objective was twofold: one to ascertain the importance of hydraulic effects produced by the passage of such ships, and the other to determine the power required for a speed of 13 km. per hour in varying conditions. The principal results of this investigation are set out in graphs I to IV.

In order to understand the graphs, some particulars of cross sections of the Canal and of the prototype ships are necessary.

The wetted cross section of the Canal



The Ballah By-pass.

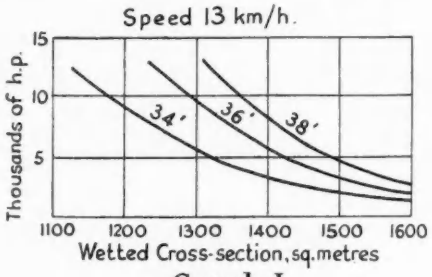
Suez Canal Improvements — continued

varies a great deal, particularly as a result of erosion in various places; it falls, however, within the following limits:

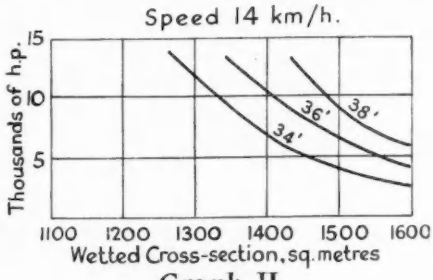
North Section	from 1,250 to	1,400 sq. m.
El Ferdan District ...	„ 1,150 „	1,250 sq. m.
Toussoum District ...	„ 1,200 „	1,350 sq. m.
South Section	„ 1,050 „	1,200 sq. m.

Those parts of the Canal with less than 1,200 sq. m. amount to only 20 kilometres, but a cross section of 1,200 sq. metres is common enough.

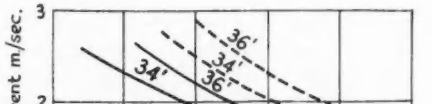
The vessel used as a prototype for the Grenoble experiments was a tanker of 36,600 tons burthen, 17,000 h.p. engines, length 211.50 metres and beam 27.70 metres. Her wetted cross section was 284 square metres at 34-ft. draft, 301 sq. metres at 36-ft. and 318 sq. m. at 38-ft.



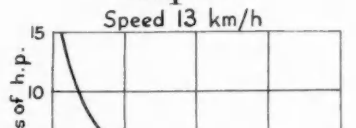
Graph I.



Graph II.



Graph III.



Graph IV.

For comparison, the *World Glory*, at present the largest tanker using the canal, has a beam in excess of 31 metres, and a wetted section of nearly 325 sq. metres at 34-ft. 6-in. draft.

It will be seen that the ratio of the minimum cross-section of the Canal and the wetted cross-section area of the largest ships fully loaded is less than 4 in the narrow parts.

This being so, a ship drawing 34-ft. would, as shown in graphs I and II, have to develop about 15,000 h.p. to maintain convoy speed of 13 km. per hr., while, with a draft of 36-ft., convoy speed could not be achieved because the required power is greatly in excess of engine capacity.

Where the wetted cross-section of the Canal is, more commonly, 1,200 sq. m., the prototype ship at 13 knots would develop 9,000 h.p. at 34-ft. draft, and 17,000 h.p. at 36-ft. An increase of speed to 14 knots at 34-ft. draft would call for 18,000 horse power.

Thus it may be said that in the Canal a big ship must develop twice as much power at 36-ft. draft as at 34-ft., and similarly with an increase of speed from 13 to 14 knots.

One can understand the destructive action on the canal banks under these conditions. A large proportion of the power delivered at the screws is dissipated in currents and eddies, more especially as the ship's speed is increased or the clearance round the hull reduced. In particular there is generated an intense countercurrent along the hull. Graph No. III shows the mean velocity of counter-current generated by a big tanker expressed as a function of the wetted cross-section of canal, the ship's speed and its draft. A current speed of 2 metres/second is already exceeded when a ship does 13 km. per hour in a channel section of 1,250 sq. m., and when the draft is 34-ft. Now it is a matter of experience that in many places when the current exceeds 1.5 metres/second, the sand at the bottom of the Canal is set in motion.

Lastly, it is shown in Graph IV that in order for ships to make an easy transit of the Suez Canal at 13 km. per hour, the cross section of the canal must, as far as is feasible, have an area equal to four and a half times the wetted cross-section of the ship. For instance, a ship of 30 metre beam and 36-ft. draft has a wetted section of 330 sq. metres, which calls for a canal section of about 1,500 sq. metres. In this condition the speed of the countercurrent will be acceptable at 1.60 metres/second.

It will be seen from the foregoing that in order to secure a reasonable passage through the Canal of a ship drawing 36-ft., it is not enough simply to provide sufficient depth, as might have been thought to be the case; there must also be provided a Canal section of the proper shape and of sufficient width. And indeed, it is required that such ships can move in convoy at 13 knots without excessive expenditure of power. In order, therefore, to bring the Canal dimensions to the proper cross-section it has become absolutely necessary to enlarge the Canal, both as to width and as to depth, particularly in the southern part and in the district of El Ferdan.

Programme for Widening and Deepening the Canal.

Taking the above data into account, the Technical Services Department of the Suez Canal Company has put forward a programme for increasing the breadth and depth of the Canal. This is divided into two parts: the first and most urgent one concerns those lengths where the cross-section is less than 1,256 square metres, and the second and not so urgent concerns those lengths where the cross-section exceeds 1,250 square metres.

Broadly speaking, the project entails an alteration of the channel according to the district to ensure a width, at 11 metres depth, of between 70 and 87 metres, and to provide a guaranteed depth of 13.5 to 14 metres (dredging being extended to 14.5 or 15 metres).

When this has been done the Canal will have a wetted cross-section which varies according to district from 1,475 to 1,550 square metres.

Additional Improvements.

Finally, in order to facilitate the passage of vessels drawing 36-ft. of water, certain additional improvements are necessary:

(a) The deepening of the channel and roadstead at Port Said, the channel across the Great Bitter Lake, and the Lake Timsah basin.

(b) The re-arrangement of existing berths, or the hollowing out of new ones, to allow for docking along the Canal of vessels which are too slow, such as floating docks or vessels in tow, and which cannot maintain normal convoy speed.

The dredging of the Great Lake is now essential. Up till now it has grown deeper of its own accord, as the bed is formed of a salt bank which has been dissolving steadily since 1869. The depth has therefore increased from 7 to 12 metres in 80 years, but it is now stable and the present depth is fixed.

This very important programme was submitted for examination by the International Consultative Commission for the Suez Canal Works. This Commission, consisting of eminent engineers from eight different countries, devoted a large part of three sessions held last November to consideration of the problems facing it.

Taking into account the advisability, on one hand, of facilitating passage in convoy of an increased number of ships and, on the other hand, the increased dimensions of large vessels, and in particular of loaded tankers, the Commission approved the main points of the programme submitted and recommended that it should be carried out.

At the session on December 7th, 1954, the Administration Council decided, after consideration of the Commission's recommend-

Suez Canal Improvements—continued

ations, to construct the two by-passes of Port Said and Kabret immediately and also, as with the first and more urgent part, to proceed with the work of increasing the breadth and depth of the Canal. It reserved its decision on the second section, which will be carried out only if circumstances render this necessary during the next two or three years.

And so the Suez Canal Company, despite its age and the changes of circumstance, shows once more its awareness of its duty to the public and to the world, and demonstrates that it takes all necessary steps to ensure the regular transit of all ships, in the interests of all.

Suez Canal Annual Report

The Annual General Meeting of the Suez Canal Company was held in Paris on 8th June last. The following are extracts from the Directors' Report:—

The financial year under review (1954) has been marked by a new and regular increase in the volume of traffic. The optimistic forecasts which were made 14 months ago when it was decided to continue the traditional policy of the Company by reducing transit dues, have been justified, as this reduction has not prevented receipts for the year from showing an appreciable increase over the previous year.

But this rapid rise in traffic inevitably entails additional expenses, whilst the fact of approaching the end of the Concession lays on the Company new burdens of various kinds.

Such are the main reasons why the accounts this year show a net profit scarcely higher than last year and why it is proposed to keep the dividend at the same level.

Higher Transit Figures.

The number of transits by vessels over 300 tons gross rose to 13,215, showing an increase of 3.8 per cent. over 1953. Net tonnage, with an increase of 10.3 per cent. reached 102,494,000 tons. This twofold increase is due mainly to oil tankers, with 6,925 passages and 65,012,000 tons. The average daily number of transits was 36.2 vessels as against 34.9 in 1953.

Among the 46 countries whose ships used the Canal in 1954, Britain retains first place with a record tonnage of 32,909,000 tons, which represents a share of 32.1 per cent. of the total. Norway takes second place with 14 per cent. of the total, and Liberia third place, with 9.3 per cent., due to a large increase in the tonnage of oil tankers. France, although showing an increase of 1 million tons, takes fourth place, with 9.2 per cent. of the traffic.

Cargo traffic, totalling 96,881,000 tons weight, shows an increase of 7.2 per cent. compared to 1953.

Southbound traffic, with 22,370,000 tons, is slightly lower. Northbound traffic, with 74,511,000 tons, shows an increase of 6,630,000 tons, or 9.8 per cent. compared with the previous year.

As a whole, the year 1954 brought no material change to this balance of trade and to the pattern of traffic such as it has been over the past ten years, the consistency of dry cargo traffic and the increase in oil shipments having been its salient features. All forecasts lead to the conclusion that this will continue to be the position in future years.

The Accounts.

Total receipts in 1954, including receipts in respect of past financial periods, amounted to 32,455,700,791 francs, an increase of 1,602,170,277 francs over the previous year. Expenditure for the year amounted to 15,122,860,163 francs. After deducting interest on and redemption of capital, and expenditure in respect of past financial periods, the surplus comes out at 15,593,811,114 francs.

Transit receipts have improved by 5 per cent. from last year. Charges in respect of interest on and redemption of capital show scarcely any change.

To the surplus of 15,593,811,114 francs is to be added 16,058,846 francs brought forward from last year, so that the total sum for distribution amounts to 15,609,869,960 francs.

It is proposed that the following appropriations be made out of this sum to the following provision accounts: Depreciation and Renewal of Plant, 1,000 million francs, this amount being justified by the large orders already placed; 2,500 million francs to Reserve for New Works, having regard to the statement already made on the first instalment, now being carried out of the 8th programme of improvement works; Insurance and Contingency Funds, 600 million francs; and 1,000 million francs to Extraordinary Reserve.

After these various allotments, a sum of Frs.10,509,869,960 will remain available. The distribution proposed amounts to Frs. 10,422,535,211, leaving a balance of Frs.87,334,749 to carry forward.

The proposed distribution would correspond to a gross dividend of Frs.9,250, to which will be added, in the case of capital shares, the statutory interest for 1954, amounting to Frs.1,429.28.

The full report, in French, will be sent on application to the Suez Canal Company, 6, Bishopsgate, London.

Dust Control in Handling Grain Cargoes

At its fourth session (Genoa, 1951), the Inland Transport Committee of the International Labour Organisation adopted a resolution inviting the Governing Body of the International Labour Office to draw the attention of governments to the problem of the protection of dock workers against dust resulting from the handling of grain.

The German Ministry of Labour carried out an investigation of six inland ports. The findings of the factory inspectors who undertook the investigation are contained in a report which may be summarised as follows:

The report begins with a well illustrated description of the conditions prevailing in warehouses, silos and transport undertakings, their technical installations, the measures taken to reduce excessive dust formation, and the types of work in which workers are most exposed to dust.

The medical part of the report is based on the examination of thirty-nine workers who were particularly exposed to grain dust. Four persons were found to suffer from affections of the external ear, ten from skin affections, thirty-four from conjunctivitis, thirty-one from pharyingitis, twenty from bronchitis and thirteen from cardiovascular disorders. Complaints were made that these irritations were caused in particular by grain from North Africa and the near East, which now has a much higher dust content than before the Second World War.

The medical findings led to the carrying out of an analysis of dust samples which proved that grain dust does not constitute a silocosis risk, on account of its very low silica content. The health hazards of grain dust appeared to be the result of the mechanical irritation of the mucous membranes by sharp pointed hairs.

The principal difficulties encountered in the suppression of grain dust are, in fact, of an administrative nature. Customs and import regulations oblige grain importers to see that no weight losses occur in the course of shipment and storage. Even the installation of de-dusting equipment requires the prior approval of the customs authorities.

On the basis of these facts, a set of nine recommendations for effective dust control is proposed, arranged in descending order of importance:

(1) Legislation should provide that dust be removed at the first point of transfer (normally the seaport) of grain cargoes.

(2) Customs regulations should facilitate the removal of dust.

(3) Legislation should prohibit importers from making up for weight deficiencies by putting back dust previously removed during transfer operations. Dust which is unsuitable for either human or animal consumption should be otherwise disposed of.

(4) Sack-filling and weighing machines should be so enclosed as to prevent the escape of dust.

(5) Sack-filling and weighing machines should be provided with a mechanical exhaust system operating preferably through floor openings.

(6) New installations should be provided with better-fitting ducts and joints.

(7) Better facilities should be provided for regular cleaning, e.g., through mechanical exhaust systems with well distributed connections for suction hoses.

(8) Respirators, already required by regulations, should be supplied and used for all work inside the compartments of silos.

(9) Initial and annual medical examinations for dockworkers handling grain cargoes should be prescribed.

Commodity Infestation in Ports

VI.— "Good Warehousekeeping" (continued)

By W. McAULEY GRACIE
(Director and Chief Adviser of Disinfestation Limited).

In general, the good warehousekeeper will have learnt to rely to a considerable extent on regular and thorough cleaning of space as it becomes available, with due attention to walls, columns, ceilings, etc. This question of cleaning should be treated as a serious object, and as calling for real manual effort. On most establishments there are some infirm men who are treated as compassionate cases and put to light duties, without there being overmuch concern with the ultimate result. More often than not the vigorous use of a " hard " broom is essential to the satisfactory conclusion of the cleaning operation. It should be realised that the main purpose of stiff brushing is to remove caked matter from walls, floors, etc., such caked matter often being the harbourage of food insect pests. It is very sound operation that this stiff brushing, which should be applied to crevices and into spaces between floorboards, etc., should be followed by the use of industrial vacuum cleaner with its complement of tools for this general purpose of efficient warehouse cleaning. It is no disparagement to say that this particular work is too heavy for an infirm man—it is simply a hard fact that indifferent cleaning represents an unrewarded expense and also tends to give a false sense of security against spread of infestation. It is out of bitter experience that the Author finds it necessary to stress the importance of this work as justifying the employment on it of able-bodied persons who can really get down to the job.

The interior of a warehouse may look clean and smart if given a coat of ordinary whitewash. Whatever it may look, it certainly will not be proof against insect activity because it has been whitewashed. There are wall washes containing ingredients toxic to insects, and provided they are applied to sound and smooth surfaces, they are of great value in controlling insect life.

It is not to be assumed that a food warehouse has been properly cleaned unless proper attention has been given to all cavities, crevices, wall fillets, and false walls and partitions, as well as to the housing and mechanical parts of warehouse equipment. Wooden triangular wall fillets may provide dark space, behind for vast numbers of harbouring insects. Where possible, these fillets should be removed occasionally for examination and treatment of the wall angles. It would be better still if the wooden fillets were replaced in material providing a continuous surface with wall and floor.

Many cases of serious infestation in warehouses, and particularly in those not of modern design, have occurred owing to the amount of undisturbed harbourage for insects, provided by false ceilings, walls, partitions, etc. Behind them, accumulations of grain and other debris may be formed by seepage over long periods and may be capable of harbouring and feeding a large population which may at any time respond to the attractions of a new intake. It is better that there be no inaccessible or not readily accessible places in warehouses if they are to be regarded as good food warehouses.

Care should always be taken to insulate hot chambers, pipes, etc., so that they do not increase the temperature of rooms in which general food commodities are stored.

It should be kept well in mind that the thorough cleaning to which so much reference has just been made, is absolutely necessary before the use of insecticides, where the cirmustances warrant such use. The constitution of insecticides in food pest control practice has been built up largely as a matter of experience of the various resistances possessed by the creatures themselves, and it is expecting far too much of chemicals if, in addition to their function of permeating the cuticle of the insect, they have first to pass through a barricade of dust and debris. It is true that fumigants such as hydrogen cyanide, methyl bromide, ethylene oxide, etc., have considerable powers of penetration, but even their insecticidal effect is increased by pre-cleaning of the structure. Fumigation generally, however, is to be regarded as highly specialised and only to be exercised by skilled operators.

Apart from this restricted class, we are really left in stored products infestation control with the various contact poisons and it is in this connection that pre-cleaning of the structure is specially important. To be effective a contact poison must enter the body of the insect, and for that purpose has to be manœuvred through the lipoid layer of the cuticle. In the case of liquid insecticides, this is made possible by the use of an oil carrier or, in the case of a dry contact poison, by the size and shape of the particles, and their ability to remove or damage the cuticle. No advantage is served by applying quantities of insecticides to debris-covered floor areas where the insecticide is not brought directly into contact with the insect. In practice this entails, where pre-cleaning is not adopted, sacrifice of valuable constituents in the insecticide which has to be paid for, and loss of advantage in reducing the level of infestation.

Taking everything by and large, there is a strong case for thorough cleaning of food warehouses whether infestation is present or not, and whether or not any preventive or remedial treatment is to follow. It may prevent a problem arising, and in any case it will be of material assistance in getting rid of the problem should it arise.

Microscopic examination of sweepings and other debris removed from places of accumulation often may show a most disconcerting amount of insect life and the prompt disposal by destruction of all such material is imperatively necessary. It is to be hoped that in these days of modern outlook, the old and thoroughly bad practice of adding such sweepings to the sound contents of storage bins, etc., with a view to maintaining weight, is entirely discarded. Reference already has been made to the desirability of keeping parcels from different cargoes entirely separate in warehouse stowages. It is also a very good plan to use different floors for commodities according to their susceptibility to infestation and to the standards of soundness regarded as essential for the purposes of use. In former years, much infestation trouble was traceable to small balances of parcels being left over after the main delivery and not removed for long periods. Such small balances left undisturbed formed an attractive breeding ground and were the direct cause of heavy general infestation, extending over all the commodities in the particular structure.

Wherever commercially convenient, it is a good thing that oldest dated stocks should be worked out in preference to new arrivals.

There may be strong temptation to overcrowd storage accommodation for the sake of improving on the storage revenue. In the long term interest, it is to everybody's advantage that adequate inspection and working space should be reserved on storage floors. This provision is justified on several grounds—it enables working access to be obtained to the different parcels from which delivery is required, it enables inspections to be conducted to guard against fire and infestation risks, as well as to watch commodity condition, and it also avoids strains and stresses on walls, columns, etc.

In the past, cases have occurred where it has been necessary to move considerable tonnages of infested commodities for treatment elsewhere, or considerable tonnages of non-infested commodities in order to gain working access to infested commodities in urgent need of remedial treatment. Where space allows, and the floor conditions are suitable, it is of great advantage to be able, on infestation occurring, to isolate a particular pracel without removal, so that the treatment, even including fumigation under gas proof sheets, can be carried out in situ, thus limiting both the scope of the treatment and the area of the infestation.

Much credit is due to the Entomological Inspectors of the Infestation Control Division of the Ministry of Agriculture, Fisheries and

Commodity Infestation in Ports — continued

Food, for their helpful and understanding way of discharging their functions. They are never out to make trouble if it can be avoided, but are very ready to advise and recommend, and should be consulted with full confidence in their ability and desire to help. It is felt that the views expressed in these articles on warehouse hygiene are such as will be given full support by the Ministry's Inspectors, as such views are based on long and wide experience in infestation prevention measures.

As though it were not enough that the warehousekeeper must always be on the alert lest the stock of susceptible food commodities in his custody becomes subject to attack by insects which, by one means or another, have gained entry into the premises, he must also join in unremitting warfare against rats and mice, which do untold damage to the commodities in his care; and the damage so caused may ultimately result in loss by the client of home or export markets on the ground that the finished product contained minute foreign particles which may have been the consequences of infestation of the raw material while in the warehousekeeper's hands. One may be tempted at times to think that some aspects of food hygiene have been featured much too prominently with little advantage to human health but much disadvantage to trade and commerce. This is not to suggest that it is inappropriate to take proper steps to ensure that no avoidable risks to human health should be permitted. Undoubtedly in times past, the pendulum had swung too far in the opposite direction, and we are today perhaps suffering somewhat from the opposed idealistic swing.

Be that as it may, the simple fact remains that the food warehousekeeper will do well to see that whatever the public demand may require, will be conformed to in his profession and practice as a good warehousekeeper.

We are certainly not on debatable ground when condemnation is uttered against the presence of rats and mice in storage warehouses. Their presence is disturbing to the public conscience because of the risk to the common well being, and it is not their inevitability but man's neglect to control them that accounts for their presence in such numbers amongst us.

Sight should not be lost of the fact that there is a vast free population of rats and mice, pretty well up to saturation point, environmentally. In especial degree, warehouses are happy hunting grounds, for in and about such premises rats and mice may find all the harbourage, all the nesting materials, and all the foodstuffs they require. Although much has been done in the last twenty years to provide for the co-ordination of effort against rats and mice, on lines well thought out, these creatures continue to triumph over human indifference.

It is right and proper that each warehousekeeper should study his own interests by seeing that there is proper rat proofing—and rat and mouse control—in his premises, but for his own advantage he really needs to do much more than this. Other interests arise on all his boundaries and they contribute to his vulnerability. Commonsense suggests that agreement between neighbours on a co-ordinated scheme expertly devised and executed by a responsible servicing undertaking on behalf of all the participants to the scheme, offers the best and most economical solution to this grave problem which for so long has bedevilled the practice of warehousekeeping.

The warehousekeeper, along with other sections of the community, is subject to the provisions of the Prevention of Damage by Pests Act, 1949, and in respect of the presence of rats and mice in his premises, he falls under two separate and distinct duties. Under Section 3 of that Act he is bound to give notice in writing forthwith to the Local Authority, if it comes to his knowledge that rats or mice are living on or resorting to his land in substantial numbers. Under Section 13, the warehousekeeper whose business consists of or includes the storage of food, must notify the appropriate Minister if it comes to his knowledge that any infestation is present in his premises. In either case, there is a penalty for failure to notify, except that where notification is made under Section 13 to the Minister, it is not necessary also for notification to be made to the Local Authority in the same matter. Failure to notify either the Minister or the Local Authority sets up two separate and distinct offences each carrying its own penalty. The two sections, i.e. 3 and 13, make the duty of notifying dependent upon awareness of the notifiable matter. Now, in the case of Section 3, the duty arises when there is awareness on the part of the occupier that rats or mice are on his land in " substantial numbers ". In the case of Section 13, his duty arises on his becoming aware that " infestation " is present in his premises.

There is no definition in the Act of " substantial numbers ", and this is a matter which in case of difference would fall to be decided by the Courts, having regard to all the circumstances of the case. The expression " substantial numbers " was put into the Section in the House of Lords in preference to " infested " or " infestation " in that particular section, whereas, for other reasons, the word " infestation " appears in Section 13. In the Houes of Lords the test question on Section 3 was:—

" Hickory, dickory, dock,
The mouse ran up the clock."
Was that an infestation?

Of course, the real point of where the rest of the family was did not enter into the debate, but it might be the pertinent point in the event of any Court proceedings. Having regard to the known multiplication rates of rats and mice and the facilities

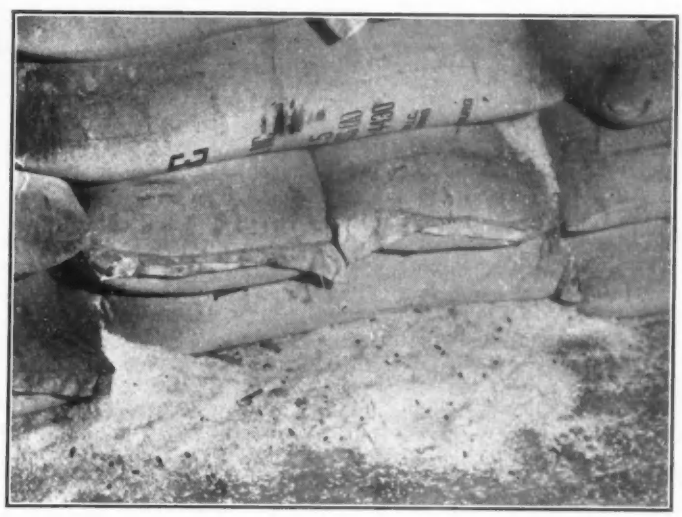


Fig. 1 (left) This fringe of webbing is a not uncommon feature in grain warehouses where there are " arrears of maintenance " both in the United Kingdom and overseas. The webbing represents a long accumulation and provides lodgment for countless pupae of Ephestia elutella, a destructive food moth. Fig. 2 (right) This illustrates that ship rats have attacked stored rice causing considerable spillage, and contamination with rat droppings.

Commodity Infestation in Ports—continued

Fig. 3. This dirty corner in a grain warehouse was evidence of a cleanly habit by the common rat which usually has a " reserved area " for its droppings. The illustration does indicate that there was a lack of regular inspection and prompts the question of what happened to the contaminated grain. This state of affairs is unlikely to happen again in the U.K. but is yet to be found in some ports abroad.

for harbourage, nesting materials and food supply to be found in most warehouses, it may be taken for granted that population expansion follows quickly on original invasion of such premises.

For the purposes of Section 13, the word " infestation " means the presence of rats, mice, insects or mites in numbers or under conditions which involve an immediate or potential risk of substantial loss or damage to food, and " infested " is construed accordingly. And what is the dictionary meaning of the word? Let us take the Shorter Oxford Dictionary as our guide; we there find:—

" 1. To attack, annoy, or trouble in a persistent manner; to molest; to harass.

" 2. To trouble (a country or place) with hostile attacks; to visit persistently or in large numbers (or even singly) with evil intent; to swarm in or about so as to be troublesome ".

It will thus be seen that the question of whether there is an infestation depends on the product of the number of individuals and the number of visits. We will not attempt a closer definition, but there is no doubt that the Courts will sufficiently understand the word and it would not be very wise for an offender to count on acquittal!

It may be observed that the 1949 Act contains an important exception from the general rule of the Act, which empowers the Local Authority to enter premises and take action on the default of the occupier to comply with a notice requiring him to take such action. The exception is to be found in Section 6 and dispenses with the requirement that the occupiers should first be given the opportunity of carrying out the work of destruction of rats or mice in circumstances where the Local Authority is satisfied that rats and mice are in substantial numbers on any site which comprises premises in the occupation of different persons and where it is expedient to deal with the land as one unit in an extermination programme.

That is a fairly good parallel depending on legal action by the Local Authority with the voluntary co-operation between neighbouring industrialists herein described. Undoubtedly, co-operation and co-ordination of effort, preferably on a voluntary basis, is the logical approach and is assured of higher dividends in security from rodent damage than are available by any other means. The Act, under Section 4, imposes a duty on the occupier to comply with a notice requiring (a) the application to the land of any form of treatment specified in the notice; (b) the carrying out on the land of any structural repairs or other works so specified, within such time as may be laid down in the notice. If the notice served on the occupier requires the carrying out of structural works, there is a right of appeal to a Court of Summary Jurisdiction, but such right does not extend to the carrying out of treatment for the *destruction* of rats and mice.

If the occupier fails to comply with the requirement as to action necessary, then the Local Authority may elect to enter on his premises and do what is necessary, charging him with the cost. In addition, the Local Authority has a right to proceed against him in the Court for failure to comply with the terms of the notice, subject to any right of appeal. It is to be noted that these are not alternative rights given to the Local Authority, they may choose to adopt either or both measures against the non-complying occupier. It is important that warehousekeepers should be reminded that their right to carry out either by their own forces or by contractors engaged by them, the necessary measures for the control of rats and mice, is preserved to them even where they receive a notice from the Local Authority under Section 4. It is only after failure to comply with a notice under Section 4 or pursuant to a notice under Section 6 about rats and mice in several adjacent premises being treated under a " one unit " scheme of operation, that the right is taken out of the occupier's hands pending fulfilment of the requirements laid under Sections 4 and 6. The effect of all this is that if and when the warehousekeeper receives from the Local Authority a notice containing a requirement on him as to the action he is to take, then it is for him to act accordingly or to see that his contractor does so. The important point is that the warehousekeeper is fully entitled to arrange for the destruction of rats and mice in his premises, and so long as this is done satisfactorily, he need be under no fear that the Local Authority will, or can, take things into their own hands.

It is surely quite unnecessary that the attention of the warehousekeeper should be directed to the importance of the maintenance of physical conditions such as temperature and relative humidity according to the different types of commodities in his care.

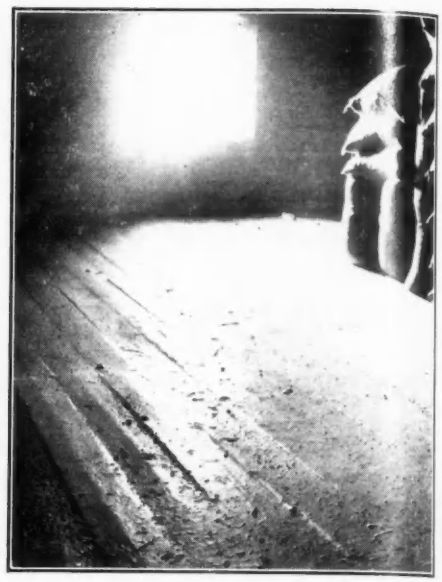


Fig. 4. This unusual picture shows the effect of silk webbing on the small balance of bagged grain on the right hand side, and the complete covering of the floor with " sheet " silk spread by countless Ephestia larvae when wandering off to pupate. There is little doubt that the floor interstices will be filled with pupal cases. This is an unsafe storage accommodation until it has been scrupulously cleaned.

We shall proceed in the next article to a consideration of methods of chemical control of infestation, with due regard to efficiency and safety factors.

An International Conference on Metal Fatigue.

The Council of the Institution of Mechanical Engineers are arranging an International Conference on Fatigue of Metals to be held from September 10 to September 14, 1956. There will be two technical sessions each day and it is hoped to obtain up to 60 papers which will be divided into groups, those in the various groups being presented for discussion in abstract form by reporters. The provisional arrangements provide for the first two days of the meeting to be devoted to stress effects and the effect of temperature and environment; the papers for the second day will cover metallurgical aspects of fatigue and basic studies including the mechanism of fatigue, statistical theories and crack propagation; and the final two days will be devoted to the engineering and industrial significance of fatigue covering marine engines, ships, welded construction, and service experience and failures in general.

Progress in Pallet Standardisation

Report on Third International Meeting

By E. S. TOOTH.

The unit load method of handling goods is slowly but surely being introduced into national industrial economies. In many European countries, in parts of Africa, and in the Australian and North American continents palletised traffic is now common, particularly with homogeneous packages. This development, which has been encouraged by standardisation, is a major one. Although the British Standard for "pallets for materials handling suitable for transport by road and rail" will not be issued until the late summer of this year, the contents of this document have been common knowledge for some time and a number of our larger industrial undertakings have planned premises and handling methods around them. Appliances for handling British Standard pallets are now in general use; warehouses and other premises specially constructed to handle palletised goods are already in existence. Most of these premises have no staunchions or columns and in many cases their floor dimensions, including height, are based on standard pallet sizes. In national spheres, the unit load method of handling goods has been satisfactorily launched.

The international aspect of this problem is being handled by a technical committee (T.C.51) of the International Organisation for Standardisation (ISO). Accounts of the first two meetings of this Committee, in December, 1952, and June, 1954, appeared in earlier issues of this Journal. The committee has been handicapped because it started work **after** various nations had made progress with their own standards; nevertheless, by the end of its second meeting, it had made a number of "draft recommendations"—first constitutional steps in formulating international standards.

It will be appropriate here to give some general information about ISO. Prior to the war, the body which undertook this work was The International Federation of the National Standardisation Associations (ISA), which was set up in 1926 and consisted of about twenty nations. This organisation was superseded in 1944 by the United Nations Standards Co-ordinating Committee (UNSCC) but after the termination of the late war UNSCC organised the inauguration of the present organisation, ISO, which thus superseded UNSCC early in 1947.

The objects of ISO cover a wide range. The Organisation exists to promote the development of standards in the world, with a view not only to facilitating international exchange of goods and services, but also "to developing mutual co-operation in the sphere of intellectual, scientific, technological and economic activity." ISO members are the National Bodies most representative of standardisation (one for each country) who have agreed to abide by the Organisation's constitution and rules of procedure. The present 37 members include U.S.S.R. and U.S.A.

ISO enjoys Consultative Status to the United Nations, which is much interested in ISO's work. ISO also has a consultative arrangement with U.N.E.S.C.O. and maintains relations with many other international technical organisations which request its collaboration for questions of standardisation appearing on their programmes.

It is important to know how an ISO standard comes into being. A Technical Committee is composed of a delegation from each of the member bodies wishing to take part in the work concerned.

In June, 1955, there were eighty ISO Technical Committees operating and their work covered widely different fields. It ranged, for example, from screw threads to the measurement of fluid flow, from acoustics to packages for frozen foods and from transfusion equipment for medical use to standardisation in the sphere of banking. The Technical Committees do not, however, cover the field of electricity. All questions of an electro-technical character are dealt with by the International Electrotechnical Commission (I.E.C.) which, although functioning as the Electrical Division of ISO, preserves its autonomy.

A Draft Proposal which has been approved by the majority of the participating members of the Technical Committee becomes a **Draft ISO Recommendation.** If such a draft ISO recommendation is approved by the majority of the ISO member bodies and accepted by the Council, it becomes an **ISO Recommendation.** If no Member Body makes an objection to the proposal to transform an ISO Recommendation into an ISO Standard, the Recommendation becomes a **Standard.**

The third meeting of T.C.51 ("pallets for unit load method of materials handling") was held in the Swedish House of Parliament in Stockholm last month (June, 1955). Attending it were delegations from ten nations: Belgium, Denmark, Finland, France, Germany, Netherlands, Norway, Switzerland, Sweden and the United Kingdom. Also present at the meeting as observers (without the right to vote) were representatives from Turkey and Indonesia and of the International Cargo Handling Co-ordination Association (I.C.H.C.A.), the International Container Bureau and the International Union of Railways. Members who did not send

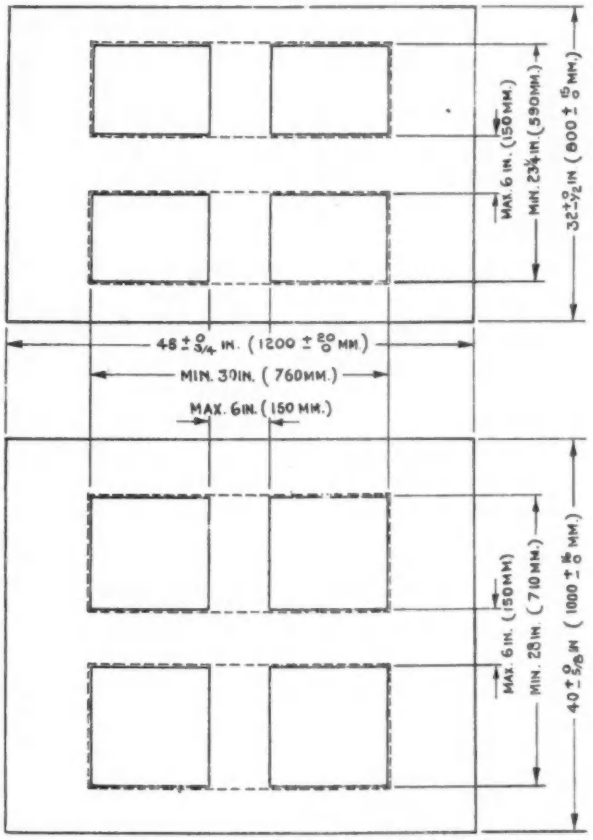


Fig. 1. Minimum openings for pallet truck wheels in bottom deck of 2-way and 4-way 32-in. x 48-in. (800 mm. x 1200 mm.) and 40-in. x 48-in. (1000 mm. x 1200 mm.) pallets.

delegations but who asked to be informed of the progress of the work numbered nineteen. They were Australia, Austria, Bulgaria, Czecho-Slovakia, Chile, Hungary, India, Italy, Japan, Mexico, New Zealand, Poland, Portugal, Roumania, Spain, Union of South Africa, U.S.A., U.S.S.R. and Yugo-Slavia.

T.C.51 had done the most spectacular part of its work at its previous meetings. It had made proposals concerning (a) three pallet nominal plan-sizes (32-in. x 40-in.; 32-in. x 48-in.; and 40-in. x 48-in.); (b) the distance from the underside of the top deck to the ground (5-in. maximum); (c) the free height for the passage of forks (3⅞-in. minimum); and (d) certain other matters including the size of bottom deck openings for pallet-trucks, plan dimension tolerances, width of wings, and handling and stacking capacities. By the time it had reached the items mentioned under (d), much of the work was complicated and technical. Figure (1) illustrates this. It indicates the sizes of the minimum openings for pallet truck wheels in the bottom deck of two of the three sizes of 2-way and 4-way pallets proposed for stardardising. It

Progress in Pallet Standardisation—continued

will be seen that the dimensions shown give the tolerances allowed on plan sizes. The positions of the openings take into account constructional needs; it has also been borne in mind that the bottom deck must have a certain area to meet stacking needs. It is interesting to note that in the Draft British Standard the clause covering the minimum openings in bottom decks is amplified by fourteen pages of notes and diagrams.

The agenda of the Stockholm meeting was made up of complicated and meticulous items of this kind. The committee finally settled (although only by a majority vote) the question of the minimum openings in the bottom deck of the smallest pallet proposed for standardisation (i.e. 32-in. x 40-in.) and went on to reconsider the question of the width of wings. Although this matter was discussed at length, it was not resolved and was referred to the Working Group for further investigation and report. The committee did, however, come to the unanimous decision that the area of the bottom deck of a double decked pallet shall not be less than 40 per cent. of the area of the top deck.

A draft resolution was also passed on the vexed question of large pallets intended mainly for sea transport. This matter had been twice considered at previous meetings and twice postponed, the second time so that it could be thoroughly explored by a specially constituted Working Group. The recommendation of this Working Group was that " pallets of nominal plan size 48-in. x 64-in. and 48-in. x 72-in. should be included in an ISO recommendation relating to large pallets," and this recommendation was ultimately adopted as a Draft Resolution. It should be noted that the term " stevedores' pallet " is no longer employed in the field of standardisation. Although the large pallet is intended mainly for goods which have to be conveyed in ships for part of their journey, it is felt that to name it the " stevedores' pallet " is misleading. What is now regarded as a " stevedores' pallet " is a dock tool which does not leave the stevedores' custody.

Chamfering was another matter which created discussion and work. Efforts were not in vain, however, for the committee unanimously recommended that the members of the bottom deck of a pallet shall be chamfered on each side of the top face in the following way:—

(i) the angle between the chamfered surface and the horizontal shall be 40° ± 5°.

(ii) the height of the vertical face of the member shall be ½-in. ± ⅛-in.

This recommendation applies to a pallet made of any material when the thickness of the member concerned exceeds ⅜-in.

Expendable pallets were brought into the discussion in a positive way for the first time at the Stockholm meeting and it was agreed that all the fundamental recommendations so far made upon the dimensions of non-expendable pallets should apply equally to expendable pallets. More complicated aspects of this question were referred to the Committee's Working Group for discussion.

One of the most controversial matters dealt with was that of the external dimensions of box and post pallets. The issue was a simple one. It was agreed that the length and breadth of box and post pallets should be the same as those of standard flat pallets but the question was, should that length and breadth include or exclude the thickness of sides or posts? In favour of excluding the thickness of sides was the argument that there must be as much area on the " floor " of the box pallet for stowing standard-size packages as there is on the deck of a flat pallet. (It is interesting to note here that package dimensions are already being based on standard pallet sizes. One nation gave 380 mm. (15-in.) x 285 mm. (11¼-in.) x 190 mm. (7½-in.) as logical dimensions of packages for stowing on any of the pallets recommended for standardising).

Against the argument quoted is the fact that the plan dimensions of flat pallets were carefully calculated so that these pallets would be suitable for stowing in road and railway vehicles. Therefore, it was contended, the **overall** length and breadth of box and post pallets should be the same as those of flat pallets. Moreover, it was stated, box pallets are normally used for miscellaneous goods, or at least for goods which are not packed. They are not often used for homogeneous " square " packages of standard sizes.

The International Union of Railways' representative made a useful contribution to this discussion, which covered a wide range. From another source came the statement that there is a growing tendency throughout the world for railway organisations to relate their charges to " loadability," and evidence was given that experiments made by increasing the basic sizes of pallet loads by overlapping had sometimes produced alarming results. In one case loadability of road vehicles was even halved. Box pallets with **internal dimensions** equal to flat pallet plan sizes would, it was stated, have the same effect.

The draft resolution which finally resulted from this long and difficult discussion consisted of only eighteen words: " The external dimensions of box and post pallets shall not exceed the corresponding plan dimensions for flat pallets."

Another interesting matter was terminology and definitions. In the Draft British Standard this is dealt with in a page and a half but in that document there was no language complication. Since this was another matter which called for much preliminary work before it was ready for discussion by the full committee, it also was referred to the Working Group.

On the question of the testing of pallets, discussion arose not only upon what kind of tests should be applied but also upon whether the same tests should be applied whatever the material used in construction. The specifying of test requirements was a matter also raised.

Delegations, however, had not come prepared to tackle this very important matter. It was agreed, therefore, that each country should endeavour to supply information on testing, where possible organising tests themselves, so that the Working Group could examine the question with a view to producing proposals for consideration at the next meeting of the full committee.

The last item considered was the question of standardising handling equipment for use with pallets, a point raised by the representative of I.C.H.C.A. It was agreed that if this work were to be undertaken it should be confined to equipment which comes into direct contact with, and is special to, the use of pallets. It was decided to request the ISO Council to extend the scope of the committee accordingly.

The present position of the work so far done by T.C.51 is given below. Some of the most difficult matters to resolve were items (d), (e), (g), (h) and (l). There are, however, several items equally as complicated still on the committee's agenda.

Principal matters which have reached Draft ISO Recommendation Stage.

(a) Plan sizes 32-in. x 48-in. and 40-in. x 48-in.
(b) Underside of top deck to ground, 5-in. minimum.
(c) Free height for passage of forks from any side, 3⅞-in. minimum.

Principal matters now the subject of Resolutions by T.C.51.

(d) Plan sizes 32-in. x 40-in.; 48-in. x 64-in.; 48-in. x 72-in. (last two sizes suggested for sea transport).
(e) Dimensions of minimum openings of bottom decks.
(f) Tolerances allowed on plan dimensions.
(g) Handling load, non-expendable pallets, 1,000 kilograms.
(n) Stacking load, non-expendable pallets, 4,000 kilograms.
(i) Area of bottom deck of double-deck pallet—not less than 40 per cent. of area of top deck.
(j) Details of chamfering requirements.
(k) The inclusion of expendable pallets in the standard.
(l) External dimensions of box and post pallets not to exceed corresponding plan dimensions of flat pallets.

Internally, across land boundaries and in the short sea trades palletised traffic is rapidly growing. These developments have undoubtedly been assisted by the work of ISO's technical committee. Just the existence of the committee, in fact, has stimulated much interest in the throughout movement method.

It is reasonable to believe that as the proportion of palletised traffic continues to increase, the tendency for it to seep into the remaining international traffic lanes will also become greater. Once the unit load method is introduced into transocean trading, the final major development in the present revolution in goods handling methods will indeed have begun

B.T.C. Docks and Inland Waterways

Review of Annual Report for 1954

The Seventh Annual Report of the British Transport Commission for the year 1954 was published at the end of last month. It appears in two volumes, the first containing the report and the second the financial and statistical tables. The Commission, conscious of the need to attract public attention to the results and to its opinions and hopes, has included in the first volume a series of illustrations showing recent improvements and developments in its services. At the same time and with the same object a booklet "British Transport 1954" has been published for sale at the price of one shilling, intended to reach readers who could not be expected to study the report itself. This booklet is liberally provided with charts and diagrams, and includes as appendices the financial results and certain statistics in summarised form. The charts and diagrams enable the reader to compare the results during the seven years since the Commission took charge of British Transport; these are accompanied by explanations of the year's main features and of notable developments. In view of the fact that managerial decisions on policy and on day to day administration continue to receive so much public attention and that the Commission cannot hope to achieve many of the economies and improvements which are so necessary without public sanction, these attempts at publicity are very welcome.

Deficit on Year's Working.

Following two years (1952 and 1953) in which a nett surplus was just attained, the year 1954 is marked by a deficit once more; furthermore, an even larger nett deficit for 1955 is almost certain. If the accumulated deficit by the end of this year amounts to £80 million, as is expected, it will be easy for critics to condemn the Commission for mismanagement, using the test of earnings. However, the results are so much affected by economic and political conditions, outside the control of the Commission, that deficits do not necessarily mean incompetence. Indeed, even if the Management had attained the highest degree of efficiency and economy in 1954, which was scarcely the case, a deficit would probably have resulted from a year in which the effect of inflation was severe, in which difficulties in reaching satisfactory agreement with employees were acute, and when the commercial freedom provided in the 1953 Transport Act had not been realised.

Now that the effect of this Act is beginning to be felt, with the loss of much of the Road Haulage business, the Railway influence in the commission is becoming even more preponderant than was the case in the past. Certainly, its balance sheet will be judged more on railway results than on anything else. This can be unfortunate for those concerned in the other important activities of the Commission, that is to say, Docks, Inland Waterways, and Road Services. The Commission's interest in Road Haulage is of course becoming reduced and it very soon will only consist of certain special haulage operations, the rest of its previous haulage activities having been returned to private enterprise. It will retain, however, its passenger services and also enjoys the income from investment in other passenger transport undertakings which it does not control. A significant, although not strictly fair, comparison can be drawn between the nett book capital assets and the nett receipts obtained (before interest on capital and central charges are deducted), as can be seen from the following figures:

	Fixed Assets and Goodwill	Net Receipts (1954)
Railways	£1223 million	£14.8 million
London Transport ...	£144 million	£2.3 million
Road Haulage ...	£36 million	£8.7 million
Road Passenger ...	£65 million	£5.0 million
Docks	£73 million	£2.6 million
Inland Waterways ...	£22 million	£0.2 million (Deficit)
Ships	£10 million	£1.1 million
Certain other activities ...	£42 million	£5.3 million

From these sample figures, upon which no further comment is made, the preponderant influence of railway returns on the results as a whole can readily be seen. At the same time, if the capacity to earn a sufficient profit (to make a fair contribution towards interest and central charges and still not show a nett deficit) is taken as proof of efficiency, most of the other activities compare favourably with the railways. It should however be noted that the figures for Road Haulage are not strictly comparable, due to the disturbance of the disposals operation, as a result of which goodwill valued at £25 million has already been effectively written off.

Decision on policy affecting all the operations of British Transport must, however, be expected to be made in the light of the success or failure, the good fortunes or difficulties experienced by the railways, and the more detailed comments on Dock and Inland Waterway results must be considered with this in mind. The Chairman of the Commission is believed to have said, at a conference held when the report was released, that in his opinion the principal causes of the deficit were increased costs (especially wages and salaries) loss of traffic to road, and the maintenance of uneconomic services. As to the future, he is reported to be much concerned about the effect of the railway strike this year, not so much due to the loss of income during the strike as to the permanent loss of traffic to the railways resulting. He is believed, however, to be optimistic that the schemes of improvement and modernisation (for railways, docks and waterways), involving considerable capital investment, will eventually turn the scales and, by permitting an increase in productivity per man-hour, might result in a return to balance by 1956.

In the chapter "Development" of the report, details are given of the £1,200 million modernisation plans for the railways, and the following observations are made:—

"Apart from the importance of the Plan to the Commission's finances in the years ahead, the Commission stand by the view they expressed in 1954, namely that the provision of a thoroughly modern railway system in this country, fully able to meet both the current needs of trade and travel and those of the foreseeable future, cannot be longer delayed without harm to the national economy.

"The course of capital development in other branches of the undertaking, such as the docks, road haulage and the road passenger services, will also be related, generally speaking, to the prospective revenue yield on the expenditure entailed. In this context it is perhaps desirable to repeat that the policy of the Commission at all times is to conduct their affairs in a businesslike manner, and to afford the maximum of service consistent with a balancing of their budget. Not only must fresh capital expenditure on the railways and on the Commission's other services yield a proper return, but greater productivity with existing equipment is both possible and essential."

DECREASE IN DOCK TRADE

At the Commission's docks, the total trade of 67.4 mn. tons in 1954 represented a decrease of 2.8 per cent. on the previous year, partly accounted for by lower coal shipments and some lower imports. Iron ore imports increased, however, particularly at Port Talbot and Barrow. The total tonnage handled at Grangemouth was the highest since 1926.

The total fleet owned at December 31 last, was 116 vessels of 66,491 net registered tons, and 20 vessels of 13,831 net registered tons were, in addition, jointly owned or operated by the commission.

During the year under review, further progress was made in improving the accommodation and equipment at the commission's docks, and an expenditure of over £3 mn. was authorised on new works and equipment. The commission have constantly in mind the need to improve the turn-round of ships using their docks, and to expedite the movement of goods by the modernisation and extension of handling equipment. Apart from additional mobile cranes and electric trucks, a total of 117 quay cranes, ranging in type from general cargo appliances to heavy duty grab cranes were on order. Protracted delivery times have delayed the benefits which will result from this important form of mechanisation.

At the Humber ports, the reconstruction of No. 12 quay at the King George Dock at Hull was completed, modification of the transit shed on the east side of the Royal Dock, Grimsby, was carried out, also extensive renewals to the sheds and quays at Immingham. A new twin grab hopper dredger and four dumb hopper barges for the dredging fleet serving the Humber ports were

B.T.C. Docks and Inland Waterways—continued

delivered, and a self-propelled hopper barge and a tug were ordered. Authority was given for the replacement of coal hoists at Immingham by three radial tipplers and conveyors.

South Wales Improvements.

At the South Wales docks, a new twin grab hopper dredger was delivered. Various parts of the scheme for modernising and extending the supply of electricity were brought into operation, including ring mains at Swansea and Newport. The further extension of Margam wharf at Port Talbot to deal with rising imports of iron ore was nearing completion. Construction of a new entrance jetty and the provision of impounding pumps at Swansea to improve the facilities for deep draffed vessels were authorised; also the provision of four 10-ton grab cranes at Newport.

At Southampton, the improved accommodation for the passenger and cargo trade of the Union-Castle Line will, it is hoped, be completed by the end of 1955, bad weather and labour shortage having delayed the work of reconstruction. Delivery started of electric cranes to replace hydraulic appliances at Plymouth.

At Middlesbrough, work was begun on the scheme to provide transit sheds and improved quay facilities to meet the needs of liner services, and at the Hartlepools, the construction and equipping of the deep water berth is well forward.

At Garston, a new twin grab hopper dredger was delivered, and improvements to the quay and modernisation of the cranage were authorised. For Barrow, two further 10-ton grab cranes were authorised. At Ayr, two 50-ton coaling cranes were being erected.

Northern Ireland Traffic.

The commission gave close consideration during the year to the requirements for cargo traffic between Great Britain and Northern Ireland. Authority was given for improvements at Heysham Harbour (including the provision of four 4½-ton cranes), and a scheme for Stranraer Harbour was approved in principle. Associated with these port works are proposals for two new vessels (primarily for cargo in containers), the design of which is at present being determined.

Work was started by the commission during the year on improvements to the north and south piers at the Queensferry Passage (Firth of Forth). William Denny and Bros. Ltd., who work the ferry service by arrangement with the commission, put in hand the construction of a fourth ferry vessel. This project should minimise the delays to road traffic via this route, which occur at peak periods. As a first stage in the modernisation of the Tilbury-Gravesend ferry service, authority was given for the replacement of the pontoon at Gravesend West Street Pier by a larger structure.

INLAND WATERWAYS

As in previous reports, the results of the Carrying Activities of the Commission on its canals are separated from the accounts relating to Ownership of canals and waterways. Under both headings a small deficit resulted in 1954, before any contribution was made to central interest and other charges; the only other branch of the Commission's operations showing a nett deficit was the restaurant car service.

The following extracts from the report outline the position:—

Inland Waterways: Carrying Operations.

"The net receipts for this activity continued in deficit, a slight worsening of the position in 1954 being due to a decline in carryings in the North Eastern, North Western and South Eastern Divisions (with a consequent greater loss of revenue than the reduction in expenditure which could be achieved), partly offset in the South Western Division by a large increase in home grain traffic—which is not expected to recur. Gross receipts increased in 1954 by £39,000 (4 per cent.) to a total of £951,000. This increase was the result of a 10 per cent. increase in charges from 1st March 1954, offset by a decline in traffic, which in part arose from difficulties in recruiting and training suitable crews. With expenditure rising by £84,000, the 1954 deficit was £45,000 larger at £80,000. Carryings of coal, coke and patent fuel in Commission-operated craft fell by 66,000 tons to a total of 693,000 tons. In terms of net ton miles this traffic was two million less at 23 million, the average length of haul being 33 miles. The decline in coal was due chiefly to a reduction in the tonnage conveyed by compartment boats in the North Eastern Division owing to less coal traffic being available for shipment at Goole, labour troubles at collieries and the bad weather. For general merchandise the traffic carried, at 379,000 tons, was 10,000 tons lower than in 1953, but net ton miles declined proportionately more, by 2.7 million to a total of 25.8m. The average length of haul for this traffic was 68 miles."

Inland Waterways: Owning.

"This activity continues in overall deficit, though some sections of the inland waterways system show a reasonable surplus. The steady reduction of the deficit, from £226,000 in 1948 to £83,000 in 1953, was halted in 1954 when expenditure exceeded receipts by £119,000. This result, however, was better than that for any of the years 1948 to 1952.

"The net receipts for the geographical Divisions are given in the following table:—

	Deficit	Surplus
	£	£
North Eastern		142,000
North Western	186,000	
South Eastern	11,000	
South Western		32,000
Scottish	78,000	
Others	18,000	
Net Deficit ...	£119,000	

"The Report of the Board of Survey set up by the Commission in April 1954 divided the existing waterways into four groups for which the 1954 gross receipts per route mile from tolls, handling charges, etc., are shown below:—

Group	Route Mileage	Receipts from Tolls, etc. in 1954 per Route Mile
		£
I Waterways to be developed ...	336	3,600
II Waterways to be retained under existing conditions	994	438
III Waterways having insufficient commercial prospect to justify retention for navigation ...	771	19
IV Caledonian and Crinan Canals ...	69	217
	2,170	

"Each of these groups presents different problems. Group I has the normal commercial problems of promoting traffic at the right charges and then dealing with it as efficiently as possible. The waterways in Group II must eventually either be promoted to Group I or relegated to Group III; in the meantime their problems are much the same as Group I. The waterways in Group III should be transferred, on reasonable terms, to authorities more appropriate than the Commission to look after the functions of water supply and drainage. As the Board of Survey point out, reasonable progress towards this last objective is dependent on the initiative of the Government.

"The total tonnage of traffic on the waterways declined by 463,000 tons in 1954 to a level of about 12¼ million tons. Slight increases in carrying of liquids in bulk to nearly two million tons and of general merchandise to about four million tons were offset by a decline of about 600,000 tons in coal traffic to 6,300,000 tons, nine per cent. below the 1953 level, due mainly to a reduced tonnage being available for shipment at Goole, the extension of the grid system of supply of gas in Yorkshire and reduced output from opencast sites owing to exceptionally bad weather. The strike of dock workers at a number of the principal ports, and of lightermen in the Port of London, also seriously affected the conveyance and warehousing of traffic on the inland waterways. The severe wintry weather in January and February adversely affected traffic, particularly in the Midlands, and craft were held up for several days."

Development and Redundant Facilities.

"New or supplementary plant and equipment ordered during the year included six dumb hopper barges for the Leeds and

B.T.C. Docks and Inland Waterways—continued

Liverpool Canal. In the North Eastern Division two new vessels for operation between Leeds and Hull were placed in service and engines were installed in some dumb craft. As an experimental measure it was decided to convert one compartment tug from steam to diesel propulsion. The River Trent in the vicinity of Nottingham has a winding course and for some years the Trent River Board have been engaged on the preparation of a scheme to mitigate flooding. Removal of Holme Flood Lock at Colwick, which was narrower than the other locks, made it possible for larger craft to navigate through to the riverside wharves at Nottingham. The Commission made a contribution of £10,000 towards the cost of the works and secured relief from liability for the existing weir and the Colwick Loop, also for the Holme Cut Swing Bridge, which was removed under the scheme. Schemes were being prepared for the improvement and modernisation of warehousing and terminal facilities at a number of key points on the Commission's canal system, including Leeds and Nottingham and also for the construction of new workshops at Wigan.

"Negotiations were continued in 1954 with local authorities, River Boards and other interested public bodies to secure their assent to the closure to navigation of various short lengths of unused inland waterways and, where appropriate, the transfer of those waterways to the ownership of the authorities responsible for drainage, water supply, highways, bridges and other matters affecting the public interest. Powers were obtained in the Commission's 1954 Act to close to traffic various short sections of unused canals, totalling some 16½ miles, in the Midlands and South Wales. Similar closure powers were being sought in the Commission's Parliamentary Bill for the Session 1954-55 in respect of a further total length of some 17½ miles of unused waterways located in Westmorland, Lancashire, the West Riding, Staffordshire and the Birmingham areas. Arrangements, for which the Commission obtained Parliamentary sanction in 1954, have been made with the Mid and South East Cheshire Water Board for that Board to have the use of a part of the Shropshire Union Canal (closed to traffic but still used by the Commission to convey water from the river Dee to the active section of the Shropshire Union Canal) to carry water, pumped by the Board from the Dee near Llangollen, to Hurleston near the centre of the Water Board's distribution area. This arrangement will save the Water Board the heavy cost of constructing a pipe-line from Llangollen to Hurleston and the Board's rental will contribute to the cost of maintaining this length of canal, though not for commercial navigation. The Commission continue to seek alternative uses for those lengths of canal upon which traffic has ceased and for which they are no longer the appropriate cost-bearer; but this can only be done where abandonment has been authorised by Warrant or powers have been obtained to close these sections to navigation in the Commission's Private Acts. Experience has shown that the obtaining of a Warrant authorising the abandonment of a canal is a lengthy procedure and that Parliamentary sanction to closing a canal to navigation in the Commission's Private Acts still leaves them with many liabilities unconnected with transport."

Plans for the Future of Waterways.

The results for the year 1954 serve to emphasise the recommendation of the Board of Survey, reported in the May 1955 issue of the "Dock and Harbour Authority." The trends in traffic continue to show that those canals which can pass boats of economic size, and especially those so sited that they can pass estuarial craft and thus act as extensions to Docks have excellent prospects and should be developed as a matter of urgency. At the same time, some lengths of waterway at present carrying relatively little traffic, but which are so sited that they could carry much more if their capacity permitted, should also be granted a substantial proportion of the funds alocated for capital improvement and modernisation. It is to be hoped that the independent management of the canals (now separated from that of the Docks) and the introduction of new management personnel, whilst retaining many executives with wide experience of canal problems and prospects, will be accompanied by signs of that far-sighted and progressive policy which has been awaited for so long.

G. L. H. B.

Book Reviews

"Progress in Cargo Handling." Papers read at the I.C.H.C.A. General Technical Conference, Naples 1954. Published by arrangement with the International Cargo Handling Co-Ordination Association by Iliffe & Sons, Ltd. Price 50s. net, size 9¼-in. x 6-in. 342 pages.

Regular readers of "The Dock and Harbour Authority" will remember that in the July, 1954, issue of the Journal considerable space was devoted to reporting the 2nd Technical Conference of the International Cargo Handling Co-ordination Association, which was held in Naples during the previous month. At that Conference, which was attended by delegates from 25 countries, a total of 25 papers was presented. These have now been published in book form with, in addition, an introduction outlining the aims and programme of the Conference, together with special forewords contributed by the President of I.C.H.C.A. and the President of its Executive Committee.

Fifteen of the papers discuss different aspects of the main theme of the Conference; "The Ideal Port." The remainder deal with various specialised matters in the wide field of cargo handling. The authors include representatives of shipowners, civil and marine engineers, port authorities, shipping agents and brokers, stevedores and labour and educational organisations.

Operating methods in the ports of the world have until recent years been very diverse, partly as a result of the varying physical characteristics of individual ports, partly because of a regrettable lack of interchange of information between those concerned. The rapid development of materials handling equipment and the ever-increasing mechanisation of port working in general opens the way to improving the efficiency and prosperity of ports of all types, as well as of port users, and it is with this prospect that the book is largely concerned.

As was stated in these columns last year, a number of the papers read at the Conference have undoubted merit, others express views which will perhaps be regarded in some quarters as unauthenticated, and others present arguments which are healthily controversial. In view of the extent of the problems concerning port administration and cargo handling methods, any points of view differing from those habitually held are well worth studying. Each paper should, therefore, be considered on its merits, bearing in mind that methods which may prove satisfactory at one port may be quite impracticable elsewhere because so much in port work depends upon, or evolves from factors inherent in local conditions. A careful study of the book will emphasise this fact.

I.E.S. Code for Lighting in Buildings. (The Illuminating Engineering Society, 32, Victoria Street, London, price 5s.).

A revised edition of the above Code has just been issued. The forerunner of this work was first published in 1936 under the title "Recommended Values of Illumination"; revisions followed in 1937, 1941 and 1942 (the first to be titled "The I.E.S. Code"). In 1945 a new edition was published which took into account work carried out under the aegis of the Industrial Health Research Board and the Illumination Research Committee of the D.S.I.R. This Code was further revised and improved in 1949 and has become widely known and used both in this country and overseas. The International Commission on Illumination at its meeting in Stockholm in 1951 recommended that all countries should study the basis of the British Code when preparing codes of their own; in fact the British Code is widely adopted in other countries.

In the 1955 Code the presentation and material has been improved and account has been taken of the data on glare which has been established during the last few years.

The Code has been written to meet the needs of architects as much as those of lighting engineers. It is also intended to help users in formulating their lighting requirements. As the Recommendations of the Code cover all industries and occupations it is of importance to all who are in any way concerned with lighting.

To make clear to readers that the Code is based upon sound principles the following appears in the Preface to the Code:—

"The statements and recommendations in this Code are founded upon the general physiology and psychology of vision,

Book Reviews—continued

and upon the applied science of lighting and seeing which has grown out of numerous studies and investigations made in this and other countries, particularly during the past few decades."

The Code is divided into three Parts:—

Part I—Light and Sight explains to the layman the mechanism of seeing and the importance of differences of brightness and colour, the importance of glare and the influence of the lighting environment. It serves as an introduction to the recommendations which are given in the other two Parts.

Part II—Artificial Lighting deals with the information required before a lighting installation can be designed and with the selection and location of light sources. It also deals with general and local lighting. Glare is covered in some detail.

Part III—Natural Lighting has been written particularly to appeal to architects and the treatment is entirely architectural. The treatment is more detailed than in Part II to compensate for the relative scarcity of literature on the subject.

These sections are followed by a series of very important recommendations.

The Code also contains three appendices. The first is a Schedule of recommended values of illumination, and covers values of illumination for all industries and occupations.

The second contains a list of books and of scientific and technical papers and reports dealing with basic principles and with specific matters dealt with in the Code.

The third gives British Standards relating to equipment for the lighting of buildings.

Port Liaison Officers

In Great Britain the Boy Scout and Girl Guide Associations have arranged a system of having some adult leader connected with the Movement and who works in or near each of the major ports handling passenger traffic as a liaison officer for members of the two Movements passing through. These may be parties of

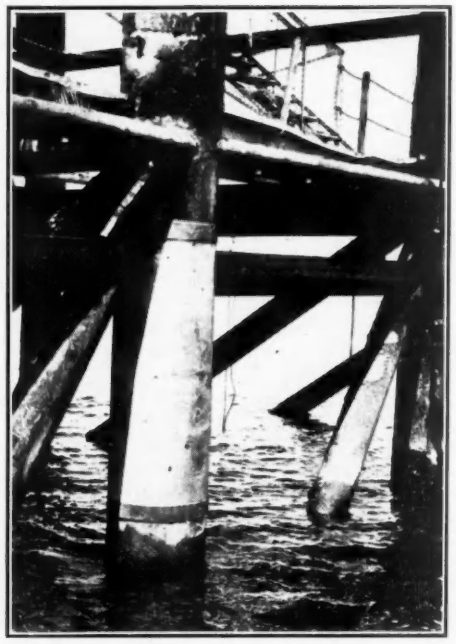
British Scouts or Guides on their way to camp abroad or of foreign visitors going to stay in this country. In a number of ports there is a large notice board placed on the passenger quay to welcome those arriving in the country and to give the address of the local Liaison Scouter. Above is an illustration of the notice at Southampton. The wording on the notice, in English, reads:—

"All Scouts and Guides arriving at this Port who are in need of assistance should apply to the Scout or Guide Liaison officers whose addresses are given below."

A number of Scout Associations in other countries have a similar system at major sea and air ports and this system is a great help in ensuring that Scouts and Guides travelling abroad can quickly get in touch with the Movement wherever they may be. Further details are available: in Great Britain from the Boy Scouts Association, 25, Buckingham Palace Road, London, and for other countries from: Boy Scouts International Bureau, 132, Ebury Street, London, S.W.1.

Monel Protection for Offshore Steel Piling

The problem of protecting steel piling in exposed situations and in warm climates is aggravated at the splash area, that is the zone which is intermittently or completely above the low tide level, and which is subjected to alternate immersion and evaporation.



Underwater parts can be guarded by cathodic protection, while the superstructure can be painted. The most vulnerable part is between the underwater portion and the superstructure, and it is to that part that special attention has to be given.

One solution recently adopted on offshore oil derricks in the Gulf of Mexico has been to encase the splash zone of each pile in a sheath of Monel, a nickel-copper corrosion resisting alloy, manufactured by Henry Wiggin & Co. Ltd., of Birmingham. The accompanying illustration shows the sheaths in position. Installed three years ago, they are said to have suffered no deterioration to date, nor has the encased pile deteriorated.

Publications Received

A booklet serving the dual purpose of a Buyers' Guide on Industrial Safety Equipment and a Handbook on General Safety and Health for all those engaged in industry, has been published by Sky Press Ltd.

"Safety and Health in Industry," written in simple, non-technical language and addressed to both the worker and the executive, shows the many types of factory accidents which can befall the worker in industry. It is fully illustrated and the advertisers represent the bulk of Industrial Safety Equipment manufacturers in the country.

One of the main sections is on the Guarding of Machinery and for what is believed to be the first time in one publication the many accident groups connected with machinery are illustrated and captioned with a safety hint. Other articles include guidance regarding the safe use of tools, the role of protective clothing, and the right way to tackle power and manual handling, lifting and stacking.

Sir George Barnett, H.M. Chief Inspector of Factories, contributes the Foreword and in this he refers to the main causes of accidents. Safety Officers and indeed all concerned with industry are likely to find this little booklet of great interest and copies may be obtained—free of charge—from the Director, Industrial Health and Safety Centre, 97, Horseferry Road, London, S.W.1.

Messrs. Renold Chains Ltd., of Manchester, have issued a booklet dealing with the use of precision chain for purposes other than power transmission. The booklet has been designed to demonstrate the wide variety of devices, motions and operations for which standard chains, attachments and wheels can be used to provide the basic mechanism.

Space considerations necessitate restricting the booklet to basic operations but there is no doubt that it will succeed in showing the possibility of utilising standard products with the advantages of availability and low price for devices which otherwise would entail costly individual manufacture.

Copies of the booklet are available on application.